SURFACE TRANSPORTATION

HEARING

BEFORE THE

SUBCOMMITTEE ON
TECHNOLOGY AND COMPETITIVENESS

OF THE

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U.S. HOUSE OF REPRESENTATIVES

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SURFACE TRANSPORTATION

TUESDAY, JUNE 4, 1991

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
SUBCOMMITTEE ON TECHNOLOGY AND COMPETITIVENESS,
Washington, DC.

The committee met, pursuant to recess, at 2:45 p.m., in room 2318, Rayburn House Office Building, Hon. Tim Valentine (chairman of the subcommittee) presiding.

Mr. VALENTINE. Ladies and gentlemen, I apologize for the initial delay of 30 minutes and the further delay, but I am sure you understand we have to vote. Sometimes we wish we could be exempt from that, but that's not the way it is.

This will be our last hearing in a series of three on surface transportation. It will also be our last hearing before drafting legislation on transportation systems for tomorrow. The subcommittee has found the Department of Transportation in need of more technically demanding research and development. Surface transportation is more vital to the strength of our economy and has more impact on our lives than space stations or supercolliders.

Most of us use some form of surface transportation every day of our lives, and surface transportation has major problems. We are all well aware of the unacceptable automobile accident rates. We are all aware of traffic congestion during work week rush hours. We have all spent longer time traveling to the center of a city than flying to it.

We know just-in-time manufacturing will not work if surface transportation prevents on-time deliveries. If we are to have better ways to travel in the future, we will first have to develop these systems and that calls for a much more aggressive R&D program at the Department of Transportation, in our opinion. These systems may not sound cheap in absolute terms, but the quality of life they can bring will make some of them appear to be bargains.

Furthermore, we do not want to become completely dependent on foreign technology for surface transportation. This hearing is intended to answer any remaining questions before we draft our bill, that is to address the questions we could not fit in earlier, also.

Our findings today suggest the research work at the Department of Transportation consists mostly of studies and assessments. We have found the Department has not been strong, in our opinion, in performing R&D in the sense that the Department of Defense and the Department of Energy and NASA have been. Therefore our bill will focus both on strengthening the R&D capabilities within the Department of Transportation and on authorizing specific projects.

We have three witnesses with us today, and I will introduce them in alphabetical order. We have Dr. John W. Fisher, who is the Director of Advanced Technology, Large Structure Systems, at Lehigh University; Dr. E. Harry Law, Chairman of the American Society of Mechanical Engineers Task Force on Surface Transportation R&D; and Dr. Jack G. Simon, Manager, Technology Liaison, Advanced Manufacturing Engineering, General Motors.

We will recognize the distinguished Ranking Member of the subcommittee when he arrives, Mr. Lewis, but pending that, I am happy to recognize our distinguished colleague Paul Henry.

[The prepared opening statement of Mr. Valentine follows:]

CHAIRMAN TIM VALENTINE

OPENING STATEMENT

SURFACE TRANSPORTATION

June 4, 1991, 2:00 PM

GOOD AFTERNOON LADIES AND GENTLEMEN.

THIS WILL BE OUR LAST HEARING IN A SERIES OF THREE ON SURFACE TRANSPORTATION. IT WILL ALSO BE OUR LAST HEARING BEFORE DRAFTING LEGISLATION ON TRANSPORTATION SYSTEMS FOR TOMORROW.

THE SUBCOMMITTEE HAS FOUND THE DEPARTMENT OF TRANSPORTATION IN NEED OF MORE TECHNICALLY DEMANDING RESEARCH AND DEVELOPMENT. SURFACE TRANSPORTATION IS MORE VITAL TO THE STRENGTH OF OUR ECONOMY AND HAS MORE IMPACT ON OUR LIVES THAN SPACE STATIONS AND SUPER COLLIDERS. MOST OF US USE SOME FORM OF SURFACE TRANSPORTATION EVERY DAY OF OUR LIVES.

AND SURFACE TRANSPORTATION HAS MAJOR PROBLEMS.WE ARE ALL AWARE OF THE UNACCEPTABLE AUTOMOBILE ACCIDENT RATES.

WE ARE ALL AWARE OF TRAFFIC CONGESTION DURING WORK-WEEK RUSH HOURS. WE ALL HAVE SPENT LONGER TRAVELING TO THE CENTER OF A CITY THAN FLYING TO IT. WE KNOW JUST IN TIME MANUFACTURING WILL NOT WORK IF SURFACE TRANSPORTATION PREVENTS ON-TIME DELIVERIES.

IF WE ARE TO HAVE BETTER WAYS TO TRAVEL IN THE FUTURE, WE WILL FIRST HAVE TO DEVELOP THESE SYSTEMS AND THAT CALLS FOR A MUCH MORE AGGRESSIVE R&D PROGRAM AT THE DEPARTMENT OF TRANSPORTATION. THESE SYSTEMS MAY NOT SOUND CHEAP IN ABSOLUTE TERMS, BUT THE QUALITY OF LIFE THEY CAN BRING WILLMAKE SOME OF THEM BARGAINS. FURTHERMORE, WE DO NOT WANT TO BECOME COMPLETELY DEPENDENT ON FOREIGN TECHNOLOGY FOR SURFACE TRANSPORTATION.

THIS HEARING IS INTENDED TO ANSWER ANY REMAINING QUESTIONS BEFORE WE DRAFT OUR BILL, TO ADDRESS THE QUESTIONS WE COULD NOT FIT IN EARLIER. OUR FINDINGS TO DATE SUGGEST THE RESEARCH WORK AT THE DEPARTMENT OF TRANSPORTATION CONSISTS MOSTLY OF STUDIES AND ASSESSMENTS. WE HAVE FOUND THE DEPARTMENT HAS NOT BEEN STRONG IN PERFORMING R&D IN THE SENSE THE DEPARTMENT OF ENERGY, DEPARTMENT OF DEFENSE, AND NASA IS. THEREFORE, OUR BILL WILL FOCUS BOTH ON STENGTHENING R&D CAPABILITIES WITHIN THE DEPARTMENT OF TRANSPORTATION AND ON AUTHORIZING SPECIFIC PROJECTS.

WE HAVE THREE WITNESSES TODAY. IN ALPHABETICAL ORDER WE HAVE:

DR. JOHN W. FISHER, DIRECTOR, ADVANCED TECHNOLOGY, LARGE STRUCTURAL SYSTEMS;

DR. HARRY E. LAW, CHAIRMAN, AMERICAN SOCIETY OF MECHANICAL ENGINEERS TASK FORCE ON SURFACE TRANSPORTATION R&D;

DR. JACK G. SIMON, MANAGER TECHNOLOGY LIAISON, ADVANCED MANUFACTURING ENGINEERING, GENERAL MOTORS.

BUT FIRST WE WILL TURN TO OUR RANKING REPUBLICAN, CONGRESSMAN TOM LEWIS FROM FLORIDA FOR HIS COMMENTS.

Mr. HENRY. Thank you, Mr. Chairman, and welcome to our guests. I am particularly pleased we are having this hearing, Mr. Chairman, and I appreciate your calling these witnesses together, because as you know, one of my concerns has been dealing with research and manufacturing and technology applications in surface transportation.

I think you are aware, Mr. Chairman, as are most of the members of the subcommittee, as well as I know the people who are testifying before us, that I am working on the preliminary draft of legislation which would focus in this direction, and help us to recapture not only technological supremacy in surface transportation, but try to combine it with market strategies that would be very helpful to the American economy.

So in that light, Mr. Chairman, just to express my belief in the importance of zeroing in on surface transportation, which is less sexy—if that's the right word, it probably is not the right word but I will use it—less attractive, less controversial than the debates we will be facing later this week on the space station, Mission on Planet Earth is every bit as important as Mission to Planet Earth. The fact that you, Mr. Chairman, have recognized that and scheduled this hearing is of great encouragement to me. Thank you.

Mr. VALENTINE. Thank you, sir. The Chair recognizes at this time Dr. Law. We would appreciate it if you would summarize, hopefully limiting your summary to five minutes. We should not have a particular problem, but we have weighty measures going on elsewhere around here today, and if you could accommodate us in that fashion, and your prepared statement will appear in the record as submitted to us. Welcome.

STATEMENT OF DR. E. HARRY LAW, CHAIRMAN, TASK FORCE ON SURFACE TRANSPORTATION R&D NEEDS OF THE COUNCIL ON ENGINEERING OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS; PROFESSOR, MECHANICAL ENGINEERING, CLEMSON UNIVERSITY; ACCOMPANIED BY PAUL FANCHER, UNIVERSITY OF MICHIGAN TRANSPORTATION RESEARCH INSTITUTE; JAMES GARDNER, BRIDGESTONE/FIRESTONE, INC.; TOM KHALIL, GENERAL MOTORS RESEARCH LABORATORIES; AND MICHAEL WISCHHUSEN, MICHELIN TECHNICAL SERVICES

Dr. LAW. Thank you, sir. Mr. Chairman, and members of the subcommittee, I am Harry Law, Professor of Mechanical Engineering at Clemson University.

I am accompanied today by Paul Fancher of the University of Michigan Transportation Research Institute; James Gardner, of Bridgestone/Firestone, Inc.; Dr. Tom Khalil of General Motors Research Laboratories; and Michael Wischhusen of Michelin Technical Services. We are pleased to be here as members of a special task force of the American Society of Mechanical Engineers on R&D needs in surface transportation.

My statement presents the views of the task force rather than a general position of ASME. As we stated to you in our testimony of April 16, all these problems must be dealt with as a total systems engineering activity. There are no panaceas. Achieving improved highway vehicle safety will require satisfactory resolution of a

number of technological and human factors and regulatory issues working in concert.

The written statement of the task force addresses a number of issues that we cannot cover in our verbal testimony. However, we will try to focus on the highlights of these issues. Mr. Chairman, we would appreciate our full statement being made a part of the record.

The impaired driver is one of the greatest threats to traffic. Impairments include alcohol and substance abuse, lack of sleep, the infirmities often associated with old age, and so forth. Research is needed to measure, study and understand the human factors issues of impaired drivers. A potential tool of this research is the driving simulator. Research that will lead to the development of driving simulators and other techniques that can be used for this purpose is essential.

Development and validation of crash protection capabilities for automobiles requires extensive, full-scale testing. Computational tools are also used in the design stage to simulate structural behavior of steel vehicles during impact. Demands for fuel efficiency, however, require the consideration of lightweight, high-strength composite materials as substitutes for primary steel structures. The state of the art of using composite materials in automotive structures as opposed to body panels is in its infancy.

To use such materials to full advantage will require several things. Understanding basic mechanical properties such as failure modes, developing economical high volume processing and manufacturing methods, quantifying environmental effects such as extreme temperature on the impact failure characteristics of composites, developing repair technologies that can be used, for example, by your neighborhood body shop, developing uniform testing methods and standards for impact performance, and developing computer models to analyze the impact energy absorption of composite materials and structures.

Related research which could enhance the technology of occupant protection include establishing a comprehensive accident data bank to identify the roles of the vehicle structure and restraint systems in mitigating injury, and developing human injury criteria and associated measurement techniques and devices for the assessment of occupant protection.

The task force also identified control systems for crash avoidance capabilities as a promising research area. A driver controls a vehicle by steering, braking or acceleration, and by shifting in the case of manual transmissions. These control actions are highly interactive in their effects on vehicle motions. The interaction can be favorable in the case of highly skilled drivers or unfavorable as in the case of impaired drivers or the average driver encountering unexpected situations.

Ideally, the driver could express desired vehicle motion to a control system that would then coordinate the actions of the brakes, steering, and so forth, to achieve it. This integration of separate control inputs by a drive-by-wire system can results in improvements in stability and maneuverability, thus enhancing the capability for collision avoidance. Research is needed in the control structure redundancy and fault tolerance requirements as well as

the maintainability of these drive-by-wire systems before they can be successfully incorporated in production automobiles.

Another safety-related issue is the potential sacrifice in wet traction capability of tires, resulting from requirements for low rolling resistance for energy efficiency. To date, reductions in rolling resistance have been made without sacrificing safety. But we are concerned that levels of rolling resistance that are being specified may not be attainable without a major technological breakthrough, added cost, or perhaps compromise of wet traction capability or tire life.

Research is required into tire design as part of the total vehicle system, with the goals of improving traction and reducing tire wear, while retaining presently low levels of rolling resistance. The problem must be viewed as a system problem that has, among others, the goals of energy efficiency and safety.

As we stated in our testimony on April 16, performance of trucks as characterized by braking performance, roll stability, and obstacle avoidance capability is particularly important. Current air-powered truck drum brakes are the result of evolutionary design changes over the last 40 years. Each new design was required to be compatible and preferably interchangeable with existing trucks and trailers.

In recent years, various design changes to truck aerodynamic characteristics, tires, engines and wheels have placed increasing demands on the brakes, and in some cases, these factors have resulted in insufficient cooling of the brake drums. Cooling of the brakes is essential to their proper functioning. R&D should be conducted into the heat transfer characteristics of truck drum brakes, and the goal is to determine whether the basic design as now used is capable of further improvement or if new designs will have to be developed.

This and other braking issues, such as automatic slack adjusters, new friction materials, automatic sensing of brake faults, electronic rather than pneumatic control of the brakes, and vehicle loading, must be addressed again in the systems context. Recent innovations such as disk brakes and ABS have widened the gap between the performance capabilities of truck and car brakes. R&D must be directed towards narrowing this gap and improving truck braking designs.

The second truck safety issue we would like to discuss is that of multiple trailers. We recognize, Mr. Chairman, that the issue of multiple trailers on our highways can become emotionally charged. Our task force would like to focus attention on some of the critical engineering issues that must be addressed to make appropriate policy decisions on how these vehicles should be used.

There are three factors that govern the safe operation of multiple trailers: the driver, the vehicle, and the road. We have already discussed some research needs regarding the driver. We would like now to focus on several issues related to the vehicle.

Sudden obstacle avoidance maneuvers may lead to amplified motions of the rear trailers, thereby leading to an increased probability of rollover of the last trailer. Research is underway to develop test procedures for determining vehicle performance with regard to roll stability, dynamic performance during braking and trailer mo-

tions during obstacle avoidance maneuvers. Further research is needed to understand vehicle performance and its relationship to safe operation on our highway system.

In some States, doubles and triples are allowed to operate under a permit system. An extended permit system could require that the dynamic behavior and the operational characteristics of these vehicles be compatible with the roads upon which they travel. Vehicles that do not meet the performance minimums should be brought into compliance.

In our written statement, we have addressed high speed rail in the U.S., from an historical perspective, and described its current status. To summarize this briefly, the U.S. started to develop a national capability in research development and production of advanced passenger rail systems in the 1960s and 1970s. However, for various reasons outlined in the written testimony, this effort was terminated and to our knowledge there exists virtually no industrial or R&D base for high speed rail in the U.S. today.

If we want high speed rail systems in the U.S. in the near term, we will have to buy foreign technology. If high speed rail is identified as a national priority, we would have to initially build on foreign technology to ultimately establish a state of the art R&D and production capability.

In summary, we have tried to present from a mechanical engineering perspective some of the research needed to improve highway vehicle safety. This is best accomplished by a cooperative effort between industry, academia and government. Innovative mechanisms for accomplishing this should be encouraged.

ASME has identified transportation issues as a major challenge to our profession, and the theme of our upcoming annual winter meeting is "Transportation in the 21st Century." Our hope is that as a society, we can begin to address and formulate approaches to solving some of the major concerns which have been discussed at these hearings.

Mr. Chairman, and members of the subcommittee, this concludes our testimony, and we would be happy to address any questions you may have.

[The prepared statement of Dr. Law follows:]

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Statement of the
Task Force on Surface Transportation R&D Needs
of the
Council on Engineering
of the American Society of Mechanical Engineers

on

Surface Transportation Research and Development Needs: Highway Vehicle Safety and High Speed Rail

Presented to the
Subcommittee on Technology and Competitiveness
of the Committee on Science, Space and Technology
of the
U.S. House of Representatives

June 4, 1991

Mr. Chairman and Members of the Subcommittee:

I am Harry Law, Professor of Mechanical Engineering at Clemson University. I am pleased to be here in my capacity as Chairman of the task force on Surface Transportation R&D needs of the Council on Engineering of the American Society of Mechanical Engineers (ASME).

Our previous testimony before this Subcommittee treated a large number of different issues ranging from Intelligent Vehicle Highway Systems (IVHS) to issues concerned with engines and powertrains. Today we would like to focus on a few of those issues related to highway vehicle safety and expand further on them. Specifically, we would like to discuss: (1) impaired driver research; (2) crashworthiness and occupant protection for highway vehicles; (3) tire technology as related to safety; (4) automobile safety control systems; and (5) safety issues related to the operation of trucks with multiple trailers. I will also present some thoughts on the high speed rail situation in this country.

I must preface my remarks by noting that this statement presents the views of the task force, a group of experts in the field, rather than a general position of the ASME.

As we stated in our previous testimony, we want to emphasize the importance of system-level thinking as policy-makers develop a national transportation policy. In doing so, we must consider simultaneously the inter-related issues of mobility, productivity, safety, energy, and the environment.

Impaired Driver Research

The impaired driver continues to pose the greatest threat to traffic safety in the United States. The impairments include alcohol and substance abuse, lack of sleep, the infirmities often associated with old age, etc. In the U.S. we have an aging population and hence driving impairments due to old age (sight, reaction time, etc.) will become an even greater problem on our highways. Driving simulators similar to flight simulators can measure and study the human factors involved with impaired drivers. This type of research can help to identify solutions to various driver impairments and greatly improve our understanding of these problems.

Research into driver simulators and other human factors to reduce the number of impaired driver accidents should be of the highest priority.

Crashworthiness and Occupant Protection

Occupant protection in motor vehicle crashes is directly influenced by structural crashworthiness, restraint systems (belts, airbags, knee bolster, etc.) and built-in energy absorbing devices in the passenger compartment. Final validation for crash protection requires considerable testing in which anthropomorphic dummies replace occupants in full scale tests. Additionally, to reduce the time required to develop a vehicle, and to generally improve the vehicle's crash performance, computer based methods are used to simulate the behavior of the structure during impact.

Crashworthiness is a multi-disciplinary, highly specialized technical area which spans the frontiers of structural mechanics, materials science, mathematics and numerical analysis. Assessment of occupant protection in a crash environment is based on human tolerance criteria derived from biomechanical impact response of human cadavers, human volunteers, and mathematical simulations.

The automotive industry, government agencies, and academic institutions have conducted extensive research which has contributed to a body of knowledge and well established engineering practices for effective design of vehicle structures manufactured from steel. However, with the inevitable increase in demand for more fuel efficient vehicles with adequate passenger space and load carrying capacity, it appears that lightweight materials such as composites could offer an alternative to steel. The state-of-the-art of using composite materials in automotive structures is at its infancy. Significant technological needs for applying composites to primary automotive structures include:

1. Development of composite material processing and manufacturing technology for high volume production of primary load-carrying structures at costs competitive with steel fabrication methods. Hollow, curved beams and thin shells are examples of these structures.

2. Development of joining methods for composite structures that would have durability and impact strength comparable to steel unibody construction.

3. Characterization of mechanical properties of composite materials at loading rates typical of motor vehicle collisions (5-60 mph). Of particular interest are failure loads and mechanisms for these less ductile materials.

4. Quantifying of effects of exposure of composite materials to harsh environments (temperature extremes and humidity, lubricant contact) on their impact failure characteristics.

5. Development of composite material repair technologies to insure adequate strength of vehicle components previously subjected to low and medium damage levels.

6. Development of uniform testing methods and standards among material suppliers and component manufacturers for characterizing the impact performance of different composite material systems.

7. Formulation of computational procedures (nonlinear finite element techniques) to analyze the impact energy absorption of composite material components (beams and shells) and assembled vehicle structures.

In addition, related technology research which could enhance occupant protection include:

1. Establishment of a comprehensive accident data bank to clearly identify the roles of the vehicle structure and its restraint systems in mitigating occupant harm.

2. Development of appropriate human injury criteria and associated measurement techniques and devices (human anthropomorphic dummies) to assess the extent of occupant protection in the event of vehicle crash.

It is the opinion of the task force that one of the research and technology needs in the area of crashworthiness is the development of computer codes for composite materials. The analytical methods as implemented in computer codes that may be used to analyze crashworthiness of metallic structures have advanced greatly in the last few years. In the case of composite materials, the ways in which failure occurs, or failure modes, are considerably more complex than for metals. Research should be conducted that is directed at understanding these basic modes of failure for composite materials. Provisions for accurately describing them may then be incorporated within the analysis tools used for design.

There are other fundamental aspects of the performance of composite materials that need to be investigated and understood before they can be quantified and incorporated in the computer analysis tools used for design purposes.

With respect to occupant protection, it is the opinion of the task force that a comprehensive accident data bank should be established. Data would be collected and interpreted in such a way as to clearly identify the role of the vehicle and its restraint systems in mitigating injuries to the occupants.

Research must be conducted that is aimed at developing appropriate criteria for human injury. Associated measurement techniques and devices (human surrogates) should be developed that will facilitate the assessment of the extent of occupant protection in the event of a crash.

It is also essential to develop instrumentation techniques to monitor impact energy in composite structures for the deployment of supplemental inflatable restraint systems, i.e., airbags, when the vehicle is subject to crash loads.

The majority of occupant injuries occur when the vehicle suddenly decelerates in a collision environment and the unrestrained occupant continues to move by virtue of his/her inertia and subsequently impacts the inside of the passenger compartment. Occupant injuries can be dramatically reduced if the person "rides down" the crash event with appropriate restraints (belts, airbags, etc.) that keep the occupant in his/her initial position.

Research should be conducted to identify the most effective restraint systems together with energy absorbing surfaces in the passenger compartment that will mitigate injuries in all crash modes (frontal, side, oblique, and rear impacts, rollover, etc.).

Further research needs to be done in the area of vehicle fire protection as evidenced by recent accidents involving post-collision fires in school buses as well as other vehicles. Such research might address issues such as the development of more fire resistant or retardant materials.

Automobile Safety - Control Systems to Improve Crash Avoidance

A driver can affect vehicle dynamics by steering, braking, or accelerating (and by selecting gear ratios in a standard transmission). The effect of these inputs on vehicle motions is usually highly interactive. In the ideal vehicle control scenario, the driver could express his/her desired trajectory and vehicle behavior to a control system that would coordinate the available controls to achieve it (as closely as possible within the physical limits of the system). Such systems are the next generation (whole vehicle integration) of vehicle control after antilock braking system (ABS), traction control, and semi-active suspension systems.

To achieve this integration of separate control inputs is an extremely large and difficult task that has been studied for many years. However, with the increased processing power of modern microprocessors and improved sensors, as well as improved control technology, we are approaching a time when this ideal scenario can be realized. Much research needs to be done in the control structure, redundancy and fault-tolerance requirements, diagnostics, and maintainability of these "drive-by-wire" systems before manufacturers are confident enough to proceed with their production. However, there is great potential for improvements in the safety of automobiles if they have these capabilities.

Recent simulation studies have shown, for example, that advanced four wheel steering systems integrated with advanced ABS systems have the potential of significantly improving the obstacle avoidance capability for passenger cars provides more stability and maneuverability than similar cars with conventional controls. Studies must be conducted to determine whether such systems can be incorporated in production automobiles and whether the average driver can take advantage of the enhanced capability afforded by these systems.

Tire Technology as Related to Safety

In the area of tire technology, levels of tire rolling resistance have been reduced by the tire industry in response to increases in CAFE (Corporate Average Fuel Economy) levels. The reductions to date have been made without sacrificing safety. The levels of rolling resistance that are now being specified for future vehicle programs cannot be obtained without a major technology breakthrough, added cost, or compromise of other performance. Given the current competitive situation of car makers, the pressure on them to keep costs at a minimum will prevent them from paying more for tires, and by extension, for the research required to obtain major technical breakthroughs. Thus, the tendency will be to compromise other aspects of tire performance.

To further reduce rolling resistance with existing technology, it is necessary to sacrifice both traction capability in wet conditions and the propensity for low wear. Wet traction, of course, relates strongly to driving safety. Rapid

wear is not only costly to the consumer, but it also means more worn out tire carcasses would be added to the scrap piles, already a major concern to the consumer.

One way of approaching this problem, which is ultimately rooted in the need to conserve fuel, is to fund research directed at improved mass transit, IVHS, or other highway improvements that would dramatically reduce traffic congestion and eliminate the wasted fuel consumption and pollution caused by idling cars and trucks.

An alternative approach is to conduct research into tire/vehicle design with the goals of improving traction and reducing wear while retaining the present low levels of rolling resistance. In this way, safety and environmental concerns could be addressed.

Again, it must be strongly emphasized that none of these technologies acts independently of the total automotive system. For example, we cannot design a crashworthy composite structure for the automobile without taking into account other aspects of the vehicle performance.

This is what makes the problem of automotive safety technology so complex, yet so challenging to the engineering community.

Safety Issues Associated with Trucks

As we stated in our testimony on April 16, because of the large mass of trucks with multiple trailers, serious consequences are likely to ensue from crashes involving them. Therefore research on pre-crash or accident avoidance measures for these types of trucks is particularly important.

Multiple trailer trucks can be expected to have the same type of stability, control, and flow obstruction problems as all other trucks. Problems concerned with braking capabilities, rollover stability, and acceleration and hill climbing capability need to be considered as they are for tractor semitrailers and straight trucks.

Performance issues that have safety implications are:
(a) braking; and (b) lateral motions occurring during obstacle avoidance maneuvers. We discussed these two issues in detail in our previous testimony. These issues are also important for conventional tractor semitrailer configurations.

There have been many advances in braking systems for passenger cars in recent years. Innovations such as disk brakes and ABS (antilock braking systems) have widened the gap between the performance capabilities of truck and car brakes. Research and development must be directed towards the goal of narrowing this gap and improving the braking systems of trucks.

There is also a need for investigating the influences of ABS systems on the braking and stability of multiple trailer combinations during turning on slippery surfaces.

Current truck brakes are the result of "evolutionary" design changes over the last forty years. Each new design was required to be functionally compatible, and preferably interchangeable with existing trucks and trailers. This process has led to the compressed air powered drum brakes in use today.

In recent years, significant strides have been made in reducing the aerodynamic drag of trucks, resulting in greater reliance on brakes for speed modulation and control. Trailer sizes have increased and tire and rim designs have changed with disk type wheels becoming more popular along with tubeless tires.

These changes have not only placed increased demands on the braking systems, but have also affected the operating environment of the brakes. Use of disk wheels reduces the airflow over the brake drum, and hence the rate of heat loss. Similarly, the reduced clearance between the rims used for tubeless tires and the drums can expose the tires to damage from the heat of the brakes.

It is imperative for proper functioning of the brakes that the heat that is generated during braking be rejected from the brakes. To reject more heat to the atmosphere requires either more cooling airflow or higher temperatures, neither of which is easily achievable with air powered drums. If heat can not be rejected promptly, the only alternative is to store it in the drums for later cooling. This approach is used in aircraft where repeated use of the brakes is unlikely; for a massive road vehicle it is a poor compromise, with potentially disastrous results.

It is essential to conduct research into the thermal and heat transfer characteristics of truck drum brakes and their interaction with their surroundings. The goal is to determine if the basic design now used is capable of improvement or if new designs will have to be developed.

Other truck braking issues that need to be addressed include automatic slack adjusters, new friction materials, automatic sensing of brake system faults, and electronic (rather than pneumatic) control of the brakes. It is highly desirable that all these issues concerned with braking be addressed from a systems viewpoint as modifications to one part of the brake system can significantly affect other parts.

Multiple Trailer Configurations

Double trailers have been operating on the interstate system throughout the U.S. for some time. Even though there is not extensive information and data available, it seems that it is difficult to show that these vehicles can not be operated safely. With regard to triples, the picture is less clear. The greatest concern with triples might be their ability to be driven safely in dense, high speed traffic. Certainly they could be difficult to pass on two lane roads, but perhaps they would not be used on such roads.

Since these vehicles have been operated (albeit under carefully controlled conditions) with an excellent safety record, there is evidence that experienced drivers can control these vehicles and compensate for their operating characteristics.

As we discussed during our previous testimony, sudden steering motions that occur during obstacle avoidance maneuvers may lead to lateral motion of the rear trailers. These motions can be considerably amplified versions of the motion of the tractor pulling the vehicle thereby resulting in an increased probability of rollover of the last trailer.

Research is underway to develop test procedures for evaluating roll stability, directional stability during braking, and the performance of these vehicles in obstacle avoidance maneuvers. From a technical standpoint, the researchers are trying to use objective measures of performance such as stopping distance, roll stability, rearward amplification, etc. to judge the intrinsic safety of various vehicle configurations. Given that the trucking industry is interested in safety as well as productivity, the technical issue may be reduced to setting appropriate performance levels for these vehicles.

A number of states (particularly in the western U.S.) have allowed double and triple trailers to operate under a permit system. If a permit system were to be extended to other states, there could be control over the types of roads these vehicles would be allowed to use. Additionally, such a system could require that the dynamic properties and operational characteristics of these vehicles be compatible with the roads. Research such as that described above and in our previous testimony could help in specifying minimum performance levels that could be incorporated in a vehicle certification system. Vehicles that could not meet the performance minimums could be eliminated.

Although the permits developed by trucking organizations do not now include provisions on vehicle performance, federal or state permits could include performance requirements in safety-related situations.

Comments on U.S. Efforts in High Speed Rail Technology

In the Subcommittee's Charter for today's hearing, several areas of high speed rail research needs were identified as necessary to enhance the "state of railroad art" and to allow the U.S. "...to move competitively into the next century."

This is a very difficult area to address because to the best of our knowledge, there are no U.S. research programs on advanced rail technologies, nor is there (again to the best of our knowledge) any U.S. industry qualified to build a high speed rail system.

You may recall that the prospect of high speed ground transportation was an exciting and popular one in the 1960's. United Aircraft Corporation (now United Technologies) was developing the TurboTrain which incorporated a great deal of aircraft technology. It was powered by gas turbine engines and had very low aerodynamic drag due to the results obtained from having undergone extensive wind tunnel testing in the preliminary design phase. Additionally,

it incorporated an advanced suspension system and was designed to have passenger accommodations equal to or better in comfort than those of an airplane.

In the UK, British Rail had embarked on an ambitious research program to develop the advanced technology that was to provide the basis for design and development of the Advanced Passenger Train (APT). The Japanese National Railroad was also proceeding on an extensive R&D program to support their efforts to develop the Shinkansen or new Tokaido line.

The German and French high speed efforts were in their infancy at that time.

The U.S. Office of High Speed Ground Transportation (OHSGT) was also sponsoring research in both the industrial sector and universities. A cadre of highly trained personnel was developing in various organizations in the US as a result of these efforts.

During this period, U.S. researchers frequently presented their work in international meetings. A colleague, Dr. Neil Cooperrider, and I developed and presented a course in railway vehicle dynamics several times in Germany, Canada, Sweden, and the U.S. Foreign railway research institutions sent their young engineers to this course. I relate this experience to assure you that U.S. capabilities were respected and recognized in countries that were traditionally strong in railway technology. I can assure you that other U.S. engineers and researchers were also very well regarded.

During the late 1960's and early 1970's, the United Aircraft Turbotrain was produced in a version that was purchased by the Canadian National Railways and a version that was used on the Boston to New York route. Various problems arose in service that probably were the result of too short a development period. United Aircraft gradually halted their efforts in high speed rail during this time. It seemed that impatience and disillusionment with U.S. efforts in producing high speed rail vehicles had set in among the policy makers.

Problems with other U.S. manufacturers of intercity passenger equipment during this time did not inspire confidence in the ability of the U.S. to design and produce high speed equipment.

High speed rail research was supported only by the OHSGT, and later the Federal Railroad Administration (FRA), Urban Mass Transit Administration (UMTA), and AAR. American industry relied on consultants to solve problems rather than support any significant levels of in-house or external research. The potential job market for the graduate students being trained in railway engineering was, accordingly, very limited. Many of the brightest students who could have significantly contributed to U.S. efforts took jobs unrelated to railroads.

Thus, the seeds that were planted in the 1960's and early 1970's in the U.S. were not watered and cared for. As a result, the plants withered and died - thus, there is little if any technical infrastructure in the U.S. that can be brought to bear today on the technology of high speed rail. If we want to

have high speed rail in the near future, we will have to buy foreign technology. Foreign manufacturers have more than a 20 year lead on us. We would have to start over to build this capability.

Conclusion

In closing, Mr. Chairman and Members of the Subcommittee, we have tried to present to you our best judgement, from a mechanical engineering perspective, on some of the research needed to improve highway vehicle safety. This includes technologies associated with the development,testing and evaluation of structurally sound, crashworthy composite materials, crash avoidance control systems for automobiles, tire designs that improve traction and wear while retaining the low levels of rolling resistance needed to meet fuel efficiency requirements and, finally, technologies required to improve truck safety.

I have also attempted to put into perspective the historical developments that have led to the present dismal picture facing the implementation of high speed rail transportation in the U.S. today.

Although we can offer you no quick and easy fixes to our nation's transportation problems, I must tell you that the ASME has identified the issue as a major challenge to our profession. The theme of our Winter Annual Meeting this year is "Transportation in the 21st Century", and our hope is that, as a Society, we can begin to address some of the major concerns which have been discussed at these hearings. So, perhaps in the not too distant future we can return to this subcommittee with a list of our accomplishments in achieving highway safety, rather than simply listing only the problems.

Mr. Chairman and Members of the subcommittee, this concludes our testimony and I would be happy to address any questions you may have.

MEMBERS OF THE TASK FORCE ON SURFACE TRANSPORTATION R & D NEEDS

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BIOGRAPHICAL SKETCH OF E. HARRY LAW

Dr. Law was educated at Rensselaer Polytechnic Institute, Princeton University and the University of Connecticut where he received a Ph.D degree in 1971.

He is currently professor of Mechanical Engineering at Clemson University and has held visiting appointments at Massachusetts Institute of Technology and Arizona State University.

Since 1965, Dr. Law has been active in research, consulting, and lecturing in the area of ground vehicle dynamics and control. During the period 1965 to 1987, he together with various co-authors published numerous papers and reports concerned with railroad vehicle dynamics. Since 1987 he has been working in the area of dynamics of highway vehicles. Together with Dr. Neil Cooperrider, Dr. Law developed and presented a short course on railway vehicle dynamics which was presented in Germany, Canada, Sweden and Colorado.

With Dr. Cooperrider, Dr. Law founded the consulting firm of Acorn Associates. Since its founding in 1973, Acorn Associates has consulted for numerous companies in the U.S. and abroad, mainly in the area of railroad vehicle dynamics.

Dr. Law is currently Chairman of the Transportation Committee of the Applied Mechanics Division of ASME. He ia a member and past Chairman of the Transportation Panel of the Dynamic Systems and Control Division of ASME. He also serves as an Associate Editor of the ASME Journal of Dynamic Systems, Measurement, and Control. He is also a member of the Society of Automotive Engineers.

Mr. VALENTINE. Thank you, Dr. Law. I apologize for failing to mention your distinguished university at the beginning.

Dr. LAW. Thank you, sir.

Mr. VALENTINE. Dr. Fisher, we would be happy to hear from you at this time, sir.

STATEMENT OF DR. JOHN W. FISHER, JOSEPH T. STUART PROFESSOR OF CIVIL ENGINEERING; DIRECTOR, NSF ENGINEERING RESEARCH CENTER, ADVANCED TECHNOLOGY FOR LARGE STRUCTURAL SYSTEMS, LEHIGH UNIVERSITY

Dr. FISHER. Thank you, Mr. Chairman, and thank you for the opportunity to be here this afternoon to express my views on some of these issues.

I would like to focus my own remarks on the research and development needs related to materials, construction and automation, as it applies to the transportation industry, particularly with a focus on structures, on the use of sensors, coatings and performance that are applicable to bridges and other large structural systems on the transportation system.

All of you are very much aware of the deterioration due to corrosion damage accumulation, lack of maintenance, and just simple old age on the large number of structures that we have. And there is a great need to develop materials to enhance the performance and improve construction of these large structural systems.

Obviously, some of the new materials are going to play a role, but I think we must realize that advanced new high strength steel as well as high strength concretes are probably going to be the more dominant materials in the coming decades, and hence there is a great need to look at the advances that have been made in these materials.

The advanced processing of steels, the new high strength steels and low alloy steels I think have great promise for both strength, performance and ease in fabrication. In fact, I think it is interesting to note that the Japanese claim that the use of the advanced processing steels has made their own shipbuilding industry more competitive with the Koreans. We should expect great strides to be made with our own industries related to the construction of large structural systems if we have these materials in our own Nation.

At the present time, we do not have the capability to produce these materials in the U.S., although the Title 3 program is intended to do that.

The key to the successful use of these materials, I believe, is the research and development that is needed to ensure performance and durability. All too often, we have experienced adverse behavior because we have not invested in research and development in the past. I think it is time we changed in the way we implement new materials and processes and look to the future.

I think the construction process itself needs a substantial look and improvement, and particularly in making use of some of the things in the manufacturing concepts that should be used in the manufacturing of large structural systems. The R&D related to the integration of design and construction needs substantial work, and

perhaps also the way we do this in our own Nation in building things. Often, the low bid is not necessarily the low long-term cost.

I think automation in construction is a step forward, and it is something we need to address, because I think it has the potential to provide more reliable and satisfactory systems. We have seen this in some of the systems put in place for example on three very large structures in the United States, the prefabricated orthotopic steel deck has been used for retrofitting of the George Washington Bridge, the Golden Gate Bridge, and the Throgs Neck Bridge in New York.

Another major need we need to address is sensing technologies for infrastructure assessment. All of you have a lot of gauges in the automobile you drive, and take it for granted. Yet we build multi-million dollar systems and do not gauge them at all. We ought to have some way, some more rational way of developing techniques and sensors that will tell us more about the performance of structures in service from a point of view of corrosion, behavior and damage assessment.

In fact, to date, even the very simple nature of corrosion of large bridge structures, it is not possible for those responsible for the inspection to determine if an active corrosion cell is active in place. All too often, we read in the newspapers of the resulting deficiencies that come from our inability to do that.

We need to enhance training and educational schools, and knowledge-based systems offer a mechanism to do that. These things are going to enhance safety, if we could develop technology and sensors that will alert us to premature potential failure components that are threats to the structural integrity of systems.

So I believe that a strong up front R&D effort is preferable to the alternative we have faced in the past, because too frequently we have a trial and error means of putting into place very large investments without the research and development that needed to be done.

I appreciate very much the opportunity to express these views to you. Thank you.

[The prepared statement of Dr. Fisher follows:]

Remarks By

DR. JOHN W. FISHER

Joseph T. Stuart Professor of Civil Engineering
Director, NSF Engineering Research Center
Advanced Technology for Large Structural Systems
Lehigh University
Bethlehem, Pennsylvania

Prepared for hearing on:

Surface Transportation Research and Development
Subcommittee on Technology and Competitiveness
Committee on Science, Space and Technology

June 4, 1991

IMPROVING TRANSPORTATION RELIABILITY AND COMPETITIVENESS BY RESEARCH AND DEVELOPMENT

I am Dr. John W. Fisher from Lehigh University where I am Joseph T. Stuart Professor of Civil Engineering and Director of the NSF Engineering Research Center, Advanced Technology for Large Structural Systems. I am pleased to be here today and I thank you for the invitation. My remarks will focus on research and development in new construction materials, issues of cost of construction and long term performance, robotics and automation (intelligent tools), and sensors, coatings and protective systems. I have focused on those areas in my own research, teaching and consulting over the past 30 years. My experience is supplemented by the ATLSS research program applicable to structural systems such as bridges and transportation vehicles such as buses and mass transit cars.

1. Materials to Enhance Performance and Improve Construction.

Many large structural systems in our bridges are deteriorating due to corrosion, damage, lack of maintenance and simple old age.

While the diagnosis is unanimous, the best cure for saving the infrastructure may be the real subject of debate. In short, what materials of construction will be used to reverse the damage in the coming decade? Undoubtedly, the evolution of new building materials such as fiber composites and plastics will play a key role, but in the near term, advanced, conventional materials - namely higher-strength steel and concrete - will be more dominant.

Although high-strength and more durable materials have been available for some 30 years, structures have historically been designed for materials of modest strength. The high initial cost of advanced materials, while important, has not been the greatest barrier; often, research and experience on how these materials can be incorporated into design are lacking. For example, many high-strength steels require a stringent fabrication practice to avoid service problems.

But new steels of higher strengths and toughness are increasingly being developed by the steel industry for structural applications. They include heat-treated microalloyed steels and quenched and aged steels. They have been mostly adopted in specialty applications because traditional design does not incorporate their unique characteristics or justify their higher initial cost. Their use will be justified when the total life cycle and extended service life are jointly considered.

Perhaps more important than the strength and toughness of these new steels is the ease with which they can be fabricated. Quality welds can be produced without the high preheats required of conventional materials. However, advances in suitable electrodes for welding these high-strength steels have not kept up with the advances in plate steels. Thus, cracking in the weld metal can limit successful fabrication. More welding research is crucial to assure field performance in structures.

For practical purposes, new steels will be used in connections and in other critical performance components where a premium cost can be justified. The higher material cost will be more than offset by the ease of fabrication and the increased reliability of welded joints in bridges.

As steel research progresses, concrete design strengths continue to increase from the conventional strength levels of 3,000 - 6,000 psi. Along with the rise in design strengths, however, comes a concern over quality control and the ability to test cylinders with conventional techniques. A lack of confidence in test methods may indeed be slowing the acceptance of these higher-strength mixes.

Clearly, strides have been made in the application of both high-strength materials. But with the exception of composite floors in steel framed buildings, designers have typically specified only one material or the other for a project. Their combined use, however, may create one of the most attractive material alternatives of the 1990s. These hybrid structures would boast major advantages over single-material structures; a high-strength steel/concrete composite can provide economies unattainable by using either of the traditional materials alone, resulting in structures with increased strength, stiffness, ductility, and performance. Still, there is another piece to the puzzle concerning infrastructure rehab: Where do fiber composites, plastics and other new construction materials come into play? For now, barriers still exist to the widespread application of new materials simply because the knowledge base is very limited and the demonstration of long-term durability and performance is lacking.

The greatest barrier to applications of fiber composites and other new materials may be how to provide reliable connections between these materials and traditional steel and concrete. Adhesives will likely play a major role. Not surprisingly, substantial research and development is necessary before these materials can be more commonly used.

The emergence of new composites in the automobile and aerospace industries is driven largely by weight considerations and mass production. Both these factors, though, are not critical in most traditional construction. Working conditions are radically different between the factory-dominated environment of auto and aerospace and the less controlled construction worksite. Some of the differences are mitigated when structural components are fabricated off-site, in a factory setting, but some on-site fabrication and connection is inevitable because of the size limitation necessary for transportation of components.

Before any new material can be widely implemented in the construction industry, extensive R&D is needed to expand the knowledge base. History painfully illustrates that problems occur when new technologies are applied prematurely. All too often, costly retrofit or reconstruction follows, as was the case when cracking occurred with early use of electroslag welding for bridge tension applications.

2. Future Construction - Manufacturing Concepts, Automation and "Robotics".

An area showing major promise in construction productivity is the application of automated construction concepts. The manufacturing sector has embraced these automation concepts with resulting lower costs and higher quality, but the traditional structures industry has not yet tapped the potential. The construction process should be considered as a manufacturing process, with the associated considerations of designing components with the construction process in mind. Different tolerances and construction procedures will be required, as well as new concepts for key components like structural connections.

Connection concepts have been developed and proven over decades, and there should be no radical departures in connection technology in the near term. Developments are needed, however, in the design of connections, which could lead to more modular and automated construction. These connections would be easier to fabricate and erect, while components could be fabricated primarily off-site and assembled in modules in the field. The modules would allow fabrication in a controlled factory environment.

This approach was chosen when orthotropic steel decks were used for rehabilitation of the George Washington and Golden Gate bridges. These point the way toward applications where the greater focus will be on replacement and selective removal of damaged elements.

Tolerances of these new connections will be critical to their success, and some changes in fabrication and field practices may be required. Also, a systems/cost approach must be applied, since the total cost of design, fabrication, erection and performance should all be considered when striving for the most cost-effective structure over the life cycle.

The application of new concepts to construction will require research and development, not a trial and error implementation of these concepts. In order to move the construction process toward manufacturing concepts, computer tools to coordinate and enhance the design/fabrication/erection and operation of large bridge structures are needed. This will require better integration of design and construction which is alien to our current practice which separates these activities.

Automation and intelligent tools offers the potential for more cost effective and reliable structures. This should play a major role not only in new construction but in the repair and rehabilitation of our bridge infrastructure.

3. Sensing and Infrastructure Assessment.

To improve the infrastructure management and increase service life there remains a need for new sensors, coatings and protective systems and a means of integrating systems for assessing structural performance. This demands new sensor concepts, means of effective signal processing, and effective and reliable systems useful for extended periods in adverse environments. Inexpensive on-line monitoring devices would provide an early warning of threats to structural integrity such as occurred at the Minanus River Bridge collapse in 1983 and the Schoharie Creek collapse in 1987.

We do not have effective ways to quickly identify active corrosion cells on bridge structures and frequently see extensive corrosion damage as a result. Such tools would provide the information necessary for strategic planning and allow the extension of service life without compromising structural and operational safety. They would provide a more rational alternative to the emergency reactive process that is more common today.

4. How Best to Achieve.

A much stronger R&D effort up-front is necessary-not after disasters and ineffective performance. We need to avoid the reactive posture so common to our current trial and error mode of operation.

In order to meet these needs, R&D efforts are needed in a systematic and coordinated way. The fragmented U.S. Construction industry involved in the construction and rehabilitation of the transportation infrastructure has not contributed significantly to knowledge and has been the principal proponent of the trial and error methods in use today. Although these often provide a lower initial cost, performance and durability are often lacking.

Greater effectiveness would likely result from a more active partnering between government, industry, and universities so that appropriate technology can be developed and rationally implemented. This will lead to improved safety and reduced costs as systems become more reliable and durable with increased productivity and quality.

May 1991

Dr. John W. Fisher
Stuart Professor of Civil Engineering
Director, ATLSS Engineering Research Center
Lehigh University
Bethlehem, Pennsylvania 18015

Dr. John W. Fisher has been Professor of Civil Engineering at Lehigh University since 1969. He was named to the Joseph T. Stuart Chair in Civil Engineering at Lehigh in July 1988.

Dr. Fisher has been Director of the NSF Engineering Research Center on Advanced Technology for Large Structural Systems (ATLSS) since its establishment in May 1986. The Center acts as the national focal point for scientific research and as an agent for innovative change needed to advance technological developments that will dominate large structural systems in the construction industry in the 21st century.

A structural engineer, Dr. Fisher is a specialist in structural connections, the fatigue and fracture resistance of riveted, bolted and welded structures and the behavior and design of composite steel-concrete members.

He has authored Fatigue and Fracture in Steel Bridges; Case Studies, published in 1984, and the 1st and 2nd Edition of Guide to Design Criteria for Bolted and Riveted Joints published in 1974 and 1987, respectively, and about 170 contributions to various scientific and engineering journals.

In 1986 he was elected a member of the National Academy of Engineering. Dr. Fisher received the prestigious Construction-Man-of-the-Year Award from ENR in 1987, the first member of the academic community to receive this award. In 1989 he was elected an Honorary Member of the American Society of Civil Engineers and a Corresponding Member of the Swiss Academy of Engineering Sciences. He was also elected an Honorary Member of the American Society of Civil Engineers in 1989.

In 1956 Dr. Fisher received the Bachelor of Science degree in Civil Engineering from Washington University, which also presented him with its 1987 Engineering Alumni Achievement Award. He received his Master of Science and Doctor of Philosophy degrees from Lehigh University in 1958 and 1964, respectively. In 1988, he received an honorary doctorate degree from the Swiss Federal Institute in Lausanne, Switzerland.

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Mr. VALENTINE. Thank you, Dr. Fisher.

Dr. Simon? Oh, before that—excuse me. We want to have a retroactive introduction. I will recognize our distinguished colleague from Pennsylvania, Mr. Ritter.

Mr. RITTER. I was held up with one constituent on my way to greet another. I would like to just make a few welcoming remarks to Dr. John Fisher.

John Fisher is the world's foremost bridge doctor, that's the way I know him. When these great, large, highway bridge decks fall down and there is great catastrophe, the first person they call after the ambulance is John Fisher. They ask John "What went wrong? What happened?" John has truly built an international reputation in doing this. He heads up the NSF Advanced Structures Lab for Large Steel Structures, ATLSS, that sits on the top of South Mountain at Lehigh University, and is a member of the National Academy of Engineering, and was Construction Man of the Year.

I think his remarks, Mr. Chairman, on materials, on how construction should be considered manufacturing, and how we need to get automation and high tech into construction to reduce costs and increase quality are right on target. So it is with great pleasure that I welcome John Fisher to testify before us today.

Thank you, John.

Mr. VALENTINE. If you let the record show that Dr. Fisher agrees with everything that was said. [Laughter.]

I tended to usurp Mr. Ritter's prerogative and introduce you myself. I had a little note here, but I am not led—from both of us, that I waited.

Mr. RITTER. John, you can pay me later for that introduction.

Mr. VALENTINE. Dr. Simon.

STATEMENT OF DR. JOHN G. SIMON, MANAGER, TECHNOLOGY LIAISON, ADVANCED ENGINEERING STAFF, GENERAL MOTORS

Dr. SIMON. Thank you, Mr. Chairman, and good afternoon.

My role for General Motors is to help facilitate cooperation between our federal laboratories and General Motors in developing research and development partnerships that will allow General Motors to be more competitive in the global marketplace. I appreciate this opportunity to discuss how the Federal Government can help facilitate technology transfer between the federal laboratories and the private sector.

I was the 1988–1989 SAE White House Fellow to the Office of Science and Technology Policy where I worked on both international and domestic competitiveness issues facing America. So I can tell you that the subjects this subcommittee are discussing today are very dear to my heart. I had the opportunity to visit both the private sector and the federal laboratories of Japan many times, and was amazed at the level of cooperation between each party.

From my nearly 29 years with General Motors in R&D, manufacturing engineering, and manufacturing, I am well aware that not a lot of exchange has taken place between industry and the federal laboratories. I saw the opportunity for American industry and our federal laboratories to work cooperatively through the provisions of the Stevenson-Wydler Technology Transfer Act of 1980, the Federal

Technology Transfer Act of 1986 and subsequent legislation such as the National Competitiveness Technology Act of 1989.

Rather than returning to General Motors at the Technical Center, I vowed to see if I could help facilitate technology transfer between my company and the federal laboratories.

I am happy to report that I helped to facilitate the formation of the U.S. Advanced Battery Consortium, a partnership involving General Motors, Ford, Chrysler, the Electric Power Research Institute, Advanced Battery Developers of North America, Southern California Edison and numerous electric utilities, together with the Department of Energy and its laboratories.

The U.S. Advanced Battery Consortium is designed to develop advanced energy systems capable of providing future generations of electric vehicles with significantly increased range and performance, and provide an important alternative to petroleum consumption, enhance the environment and contribute to the competitiveness of domestic battery and vehicle manufacturers. Research and development will be focused on advanced battery systems determined to have the greatest potential for commercialization. By assembling a consortium, auto companies can identify the most promising technology alternatives and concentrate research and development in those areas.

The costs of developing advanced batteries by any one company alone is prohibitive. Industry and government will share costs on a 50/50 basis. The partnership is a win/win for both government and industry. All companies who participate will provide a portion of the funding.

The findings of such research will be shared among the consortium members. The auto companies will compete vigorously on styling, performance, comfort and convenience features, etc. Each company will still have a hugh cash outlay to produce their electric vehicles. The advanced battery serves as a type of "alternative fuel." This partnership is a paradigm shift on how the North American car companies work together and, I believe, a model for the type of cooperation required for the North American car companies to compete successfully in the global marketplace.

It is my belief that government has an important role of serving as the catalyst to help American industries leverage the tremendous resources of our Federal laboratory system. Government must also provide the favorable climate to allow American industry to compete. The federal laboratories must also change. American car and truck companies must respond quickly to changing market conditions and be able to develop products of world-class quality that the customer wishes to purchase when they want it.

We must be able to work through the bureaucracy and red tape to allow researchers from industry and government to collaborate more effectively. Dual-use technology that strengthens both our defense and private sector should be encouraged by the Federal Government. I urge you to streamline the interaction with the government and the national labs to help facilitate our joint progress.

I believe there are many important areas of high risk, high cost research and development required in energy, environment and safety issues where it makes good sense for General Motors and the Federal Government to work cooperatively to develop solutions. In

many of these areas it makes good sense to team up again with Ford and Chrysler and other North American industries. These issues are challenges posed to our industry that must be met. We cannot fail.

Thank you for your attention and your time. I would be happy to answer any questions you may have.

Thank you.

[The prepared statement of Dr. Simon follows:]

STATEMENT OF

GENERAL MOTORS CORPORATION

BEFORE

THE SUBCOMMITTEE ON TECHNOLOGY AND COMPETITIVENESS

COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

PRESENTED BY

DR. JOHN G. SIMON

JUNE 4, 1991

WASHINGTON, D.C.

Thank you, Mr. Chairman, and good morning. My name is John Simon, and I am manager of technology liaison for the Advanced Engineering Staff of General Motors Corporation. My role for General Motors is to help facilitate cooperation between our federal laboratories and General Motors in developing research and development partnerships that will allow General Motors to be more competitive in the global marketplace. I appreciate this opportunity to discuss how the federal government can facilitate technology transfer between the federal laboratories and the private sector.

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The costs of developing advanced batteries by any one company alone is prohibitive. Industry and government will share costs on a 50/50 basis. The partnership is a win-win for both government and industry. All companies who participate will

provide a portion of the funding. The findings of such research will be shared among the consortium members. The auto companies will compete vigorously on styling, performance, comfort and convenience features, etc. Each company will still have a hugh cash outlay to produce their electric vehicles. The advanced battery serves as a type of "alternative fuel." This partnership is a paradigm shift on how the North American car companies work together and, I believe, a model for the type of cooperation required for the North American car companies to compete successfully in the global marketplace.

It is my belief that government has an important role of serving as the catalyst to help American industries leverage the tremendous resources of our federal laboratory system. Government must also provide the favorable climate to allow American industry to compete. The federal laboratories must also change. American car and truck companies must respond quickly to changing market conditions and be able to develop products of world-class quality that the customer wishes to purchase when they want it. We must be able to work through the bureaucracy and red tape to allow researchers from industry and government to collaborate more effectively. Dual-use technology that strengthens both our defense and private sector should be encouraged by the federal government. I urge you to

streamline the interaction with the government and the national labs to help facilitate our joint progress.

I believe there are many important areas of high risk, high cost research and development required in energy, environment and safety issues where it makes good sense for General Motors and the federal government to work cooperatively to develop solutions. In many of these areas it makes good sense to team up again with Ford and Chrysler and other North American industries. These issues are challenges posed to our industry that must be met. We cannot fail.

Thank you for your attention and your time. I would be happy to try to answer any questions you may have.

Mr. VALENTINE. Thank you, Dr. Simon, and thank each of you.

Before we get to questions, we have been joined by the distinguished member of the subcommittee from Indiana, Mr. Roemer. Do you have an opening statement you would like to make before we get to questions?

Mr. ROEMER. No, Mr. Chairman, I don't, but I appreciate your offer to do that. I will just ask this distinguished panel my questions when the time comes.

Mr. VALENTINE. Thank you, sir.

Mr. RITTER. Mr. Chairman, I would like to ask unanimous consent that my opening statement be placed in the record at the opening of this hearing.

Mr. VALENTINE. Without objection.

Mr. RITTER. Thank you, Mr. Chairman.

[The prepared opening statement of Mr. Ritter follows:]

OPENING STATEMENT
HEARING ON SURFACE TRANSPORTATION
HON. DON RITTER (R-PA)
JUNE 4, 1991

Thank you, Mr. Chairman. I'd like to congratulate you on another in your continuing series of timely hearings on U.S. technology policy.

As the United States fights back in its battle to regain its international competitivenss, advanced technologies offer an excellent opportunity to improve the overall productivity of our nation's transportation network. Advanced surface vehicles and innovations in the infrastructure itself can increase both the speed and capacity of the total system. This, in turn, can lower considerably the costs of moving people, supplies, parts, and goods among U.S.-based manufacturers and their customers, both domestic and foreign, and thereby provide our firms with an important competitive advantage.

But the potential benefits of improved modes and methods surface transportation go beyond competitiveness. Cleaner air, improved safety, better fuel efficiency and reduced reliance on imported fuels can all result from advances in surface transportation technology.

Let's face it. We need improvements in all means of transportation--planes, trains, and automobiles--to help us get from here to there with the minimum amount of lost time.

I'd like to welcome our distinguished witnesses and look forward to their testimony.

Thank you.

Mr. VALENTINE. Dr. Law, you have mentioned several matters that will be of interest to the members of the subcommittee. And I would like to ask you your frank opinion of the question of multiple trailers. I want to say at the beginning that I am one who is very much concerned about the advent of these contraptions. When we talk seriously about making it possible to operate triple trailers on the highways of this country, generally—I have said this before and I think it bears repeating, to me it's kind of like asking legislators to raise the speed limit from 65 miles an hour to 150 miles an hour.

Isn't there, per se, a severe safety problem with the cab and three connected trailers fastened behind it traveling down a highway?

Dr. LAW. There are potential safety problems with any vehicle, Mr. Chairman, and the focus of our testimony here today is that we in the engineering community need to ascertain just what the dynamic performance capability of these vehicles is.

Mr. VALENTINE. Let me ask you this way. Of course, you can have a safety problem with anything, but you have the cab traveling down the highway, if you fasten one trailer and then another trailer and then another trailer to it, haven't you increased the hazard a hundred-fold?

Dr. LAW. I can't vouch for that figure, there are problems, as I understand it, that the multiple trailer vehicles have that are similar to the problems that conventional trucks have. These vehicles are somewhat new and recent on the scene, and they are the topic of much research to determine just what their characteristics are and how they differ, for example, in their performance and their capabilities from conventional trucks.

One of the members of the task force here with me today is intimately concerned with issues concerning multiple trailers and perhaps he would like to address some of them. Mr. Paul Fancher of the University of Michigan Transportation Research Institute, if I may.

Mr. VALENTINE. Yes, if he would care to join in the discussion. Would you state your name for the record?

Mr. FANCHER. My name is Paul Fancher, from the University of Michigan Transportation Research Institute.

One of the ways I look at the vehicle dynamic situation for multiple trailer vehicles is in simple terms, the objective is the back end should follow the front end. For those of us who have pulled a wagon, it's essentially a wagon type system, with each unit following the unit ahead. To the extent that can work out well, there is a possibility of building vehicles with three trailers that will operate well in terms of the back end following the front end.

There is also the possibility, depending on the design characteristics, to build ones that are very poor at this property. So there is an engineering problem of how to design the vehicle properly. Much of my research is directed towards trying to make one that performs well.

Mr. VALENTINE. Well, would any of you like to comment on—and I don't want to belabor this, but about the safety hazards, the problem, when that type of vehicle is passing another automobile or when another automobile attempts to get around one of these

things, and you have all the extra problems that result from speed, the tires, the couplings, and all the things that go wrong. Why are we talking about this seriously?

Mr. FANCHER. My view is that it is a productivity reason, that's why the trucking industry wants to use it. For example, the large fleets that are now using double trailer vehicles have all the hardware to make a triple system. They increased their productivity 50 percent per driver, per tractor. They can carry the load with fewer vehicles and have economies associated with that.

Mr. VALENTINE. Would any member of the panel care to comment on what that type of vehicle does normally to the surface of the highway, to the curbing areas around the interchanges when you try to move off a ramp, a down ramp and an up ramp, and that sort of thing?

Mr. FANCHER. Well, I can speak to that, too, if nobody else wants to. The off-tracking of a large vehicle depends a lot on what we call the wheel base, the distance between axles, if you will. The doubles combination can be made to track at low speed around corners a little bit better than a tractor semi-trailer with a 48-foot trailer and better than a 53-foot unit.

When you get to triples, you get a little worse, but these extra articulation points help you at low speed. At high speed they hurt you, and if there isn't something done about the hitching arrangements, then you can get the problem of rearward amplification that we talk about. So there is a tradeoff between what goes wrong at low speed and what goes wrong and trying to adjust to that.

As far as pavement damage, my understanding of that is that the axle loads are all-important, how much load you have on each axle is what is going to damage the pavement. If you can have lower axle loads and still deliver more cargo, then you can save the pavement for a unit of cargo and if you can arrange your vehicle so that it has these lower axle loads per unit of cargo delivery, you can save pavement.

Mr. VALENTINE. When you place one of these so-called fuzz-busters on that machine, can any of you think of any purpose for that contraption, except to allow the driver to go faster than the speed limit?

Mr. FANCHER. I can't. In fact, a lot of the problems come about because of high speed. You don't want high speed.

Mr. VALENTINE. Can you, Dr. Law.

Dr. LAW. No, sir. In fact, in our testimony one of the things we emphasize is trying to conduct the research needed to conduct the vehicle performance and its relation to safe operation on the highway system. We brought up the issue of perhaps having a permit system that would be based on vehicle performance data that was quantitative and established through testing. Perhaps regulations could be made such that vehicles that do not meet performance minimums for safe operation be brought into compliance.

Mr. VALENTINE. If there were no State or Federal laws governing weight limits on trucks, or controlling the number of trailers you could attach behind a moving vehicle, how far do you think the trucking industry would go before they would stop of their own volition? Would they next try four trailers?

Mr. FANCHER. Possibly. I don't think I'm qualified to answer that.

Mr. VALENTINE. Five?

Mr. FANCHER. I think they would have enough trouble with five that they would not try it.

Mr. VALENTINE. What would be the extra trouble with five?

Mr. FANCHER. Keeping the back end following the front end. [Laughter.]

Mr. VALENTINE. Two engines—one to push and one to pull.

Dr. Fisher, are U.S. heavy equipment manufacturers, in your opinion, keeping up with the development of new equipment and robotics necessary for national demand?

Dr. FISHER. I don't think U.S. manufacturers have had any major role in the development of intelligent tools or robotic applications to large structural systems, or structural systems needed to construct pavements and highways. I think the Japanese are doing the dominant development in R&D in all of these areas that I am aware of to date, and in the United States there is a limited amount of work being done at a few universities and the National Institute of Standards and Technology, but very little elsewhere that would be applicable to a large system.

Mr. VALENTINE. Let me see if I understand you. It is your opinion that the Japanese now have the lead in the development and manufacture of heavy road equipment?

Dr. FISHER. Well, with the application for an intelligent tools or robotics. They are doing about the majority of the R&D work that is being done in the world. In fact, from what I read in various technical journals, it seems to me some of this is even moving from the traditional manufacturing area to Japan that we have not maintained our efforts in those areas either.

Mr. VALENTINE. Mr. Walker, the ranking member of the full committee, has joined us. I understand you have some time constraints, and I would be happy to recognize you for an opening statement or any comments you would like to make at this time.

Mr. WALKER. I don't have an opening statement, Mr. Chairman. I do have some questions, particularly of Dr. Simon, I would like to ask, but I will do that according to your time schedule.

Mr. VALENTINE. Thank you very much. We will speed along with it, and get back to you as soon as we can.

Dr. Fisher, are there practical ways that we could get more for the highway dollar through longer lasting roads and bridges, other than what has been alluded to by witnesses?

Dr. FISHER. I think we need to systematically develop the knowledge, particularly of these new material applications. I think there are possibilities for providing a durability and reliability of systems. I think we have a tendency in our Nation to do things on a reactive basis. We have to develop a major problem, and then we react to resolve it. We don't seem to be thinking or developing things that push us out into the future. I think we sort of pay the price for that.

In a large structural system such as a bridge, and even the mass transit systems we have, and the highway systems, we tend to do a lot of things by trial and error. And when it doesn't work, then we pay the price for that in the deterioration of the system and the

constant rebuilding and retrofit necessary to deal with the problem at hand.

Mr. VALENTINE. What might be the effect on construction schedules of incentive contracting with bonus provisions, wherein some of the bonus would trickle down to equipment operators and laborers, even? Are you able to discuss that with us?

Dr. FISHER. I have not really thought about that particular application, but I think there has to be developed, as we move to the next century, more cooperation between government, the industries, and universities, to solve some of these problems. At the present time, often things are done on an adversarial basis.

Our low-bid concept—I think we need to rethink that. Perhaps the separation of construction and design, which is inherent to our competitive system, maybe that needs to be rethought as well. Because obviously many other parts of the world do not do it that way, and at times I believe they do tend to have more reliable systems put in the infrastructure because of the attention to quality and the long-term cost.

Mr. VALENTINE. Do the Germans and Japanese—to name two examples of national expertise that we hear all about—in your opinion, do they do it differently?

Dr. FISHER. Yes. They do tend to do more of this cooperative work together. The design-build concept is very prevalent in Europe, and it is also quite prevalent in Japan. I think there seems to be a lot more cooperation generally, as my colleagues here mentioned, between industry and government in Japan and in Europe. I think the advent of the common market is going to further bring this to the fore. There are a lot of joint programs between industry and governments on the European continent, and although we focus a lot upon these developments in Japan today, I do believe we need to be aware that there is something moving in Europe. They, too, are developing technology at a substantial rate.

Mr. VALENTINE. When the specifications for construction of one mile of normal interstate highway having to do with the creation of the road bed and what goes under the surface, the number of inches of thickness of the gravel that goes underneath and how thick the concrete has to be, and the tar surface, these things can be measured with some degree of perfection. Then on the bid form you say "What will you charge to put down a mile?"

That will afford an opportunity for a better job, for longer life, for more money so that you can award that contract not to the low bidder, but to a higher bidder—don't you have to necessarily get into the question of how long it will last? And isn't that very difficult to compute?

Dr. FISHER. That is one of the central issues, the durability and performance of the structural system. Let me just cite a few examples that I am intimately knowledgeable about. One happens to be bridges and the problem of fatigue. We designed and built the entire interstate system without a great deal of knowledge about how it would perform under repeated loads. Then in the 1970s we started developing cracks in various types of bridge structures, and it was only at that time that we started developing knowledge about what their design should be.

I think that's what my greatest concern is—are we going to develop the knowledge at the appropriate time, when we need it, rather than waiting and rushing into the application of some of these new technologies and new materials before we have adequately defined their durability characteristics and whether or not they are able to sustain the time and repeated loads that you cite. I think that if we develop the technology we can address the issues you have raised. If we don't develop the technology, we will continue to do this on a trial and error basis, which I consider to be an extremely expensive way to do things in the long run.

Mr. VALENTINE. I have one question for Dr. Simon. In your opinion, what can you tell us about the future of non-metallic body structures for automobile fabrication? That is, are they cost-competitive, in your opinion, with steel, and do they offer the same life expectancy?

Dr. SIMON. Mr. Chairman, General Motors, as you know, today has a number of programs. Our new vans that have come out have body panels that are made of non-steel, called Sheet Molding Compound, SMC. We have also had previous experience, as you well know, with our Corvettes, with the Fiero, with the Buick Riata, and have had for a number of years fenders on some of our Buicks, Olds and Cadillacs made out of polymer composite body panels.

But in general, not only are polymer composites being looked at and addressed, but structural members are being looked at in R&D programs, not just with General Motors but with the entire auto industry. Things like carbon fiber, carbon carbon—some of the technologies we were frankly using for aerospace are coming closer and closer to automotive applications.

To answer whether they are cost competitive, it of course depends on the systems engineering approach and that means for example how many steps does it take to produce the particular product versus how you make it out of conventional materials like steel. Obviously, we would not be in the business of putting them on our vehicles if we did not think they were cost competitive.

Mr. VALENTINE. Thank you, sir. The Chair recognizes the gentleman from Michigan.

Mr. HENRY. Thank you, Mr. Chairman, and again thank you to our witnesses for their testimony and for your summations which I think creates a better interaction for questioning.

Since 1956, Congress has been reauthorizing the National Surface Transportation Act, the main fights being over state allocations, which part of an interstate system got completed first, and what is a national highway and what isn't—those same issues have come back.

Yet throughout that period, I guess it was the first reauthorization in the early 1960s, maybe the second one in the mid-1960s, where we had the setaside, it was not the Department of Transportation then, so I guess it was later on, in the late 1960s, when we put aside that setaside for research into highway traffic and safety. That's when it came in. That's basically how it has come before this committee.

What I tried to do this year, and what Mr. Walker is also very keenly interested in, and Chairman Valentine has been most supportive, because it is a different kind of reach for the committee, is

to look at that little pot of money and say "Let's not just look at the safety issue, as we have, but how do we combine the safety with technology innovation that helps revitalize an industry that is in a very precarious global market situation?"

Let me give you an example. We share suggested staff questions back and forth, they get ours, we get theirs. One of them is who sets the standards for tires in the U.S. That's kind of a DOT function, it has been part of these funds over the years, and we know the debate about the three different things, we test them out, and how some of the tire companies like it and some don't, how they came out with their ABC, and factors.

What I'm asking is, how do we get—not in terms of just putting some kind of consumer marking so the consumer knows that is buying the tire, but helping our tire companies develop a tire that is so superior that gets the American tire makers back in the market? Do you understand what I'm trying to say? It's the same function, we are still talking about safety.

How can I deal with, for example, when we are talking about what Dr. Law talked about, drive-by-wire. This committee is very excited about that, because we think of the aeronautics—Mr. Lewis is a great defender of it. I would love to ask you, except we don't have time, and the answer is obvious—how can this country be world class and have superiority in aeronautics and aviation and aerospace science and be losing surface transportation? There is something screwy.

The reason is, we have had that government partnership in aerospace. We have not had it in surface transportation. So one of the reasons for these hearings—this is the third, by the way—is to try to focus our attention on how to take this and use it as a wedge in doing the things that Dr. Simon here at the end was talking about. The problem is that relationships between Government and this industry has been so bad that we even have trouble circulating among industry to get their impact. That's how bad it is, I'm just going to tell you, there's no communication.

But let's say for example, that instead of drive-by-wire, which we are starting to put some money into, DOT money and your dreamers and highway builders and the cement people who like the idea of digging up roads and putting wires underneath for electronic guidance, and all these kinds of remote sensors and these avant garde things. We do it because we have the safety aspect set aside in the bill.

But if instead we could focus on materials science applications, so you combine strength with weight reduction, then you get the same safety benefit to the consumer. You get the environmental saving on energy, and you also get market penetration as a consequence. Of course, I know your industry is doing a lot in that area.

But that's the kind of partnership I would like to see this corner of the Act deal with. When you deal with rust corrosion issues, rust corrosion is not just a safety issue, it is a very big market issue, too, because you are dealing with the strength of the vehicle and also its durability.

In concrete research, in Dr. Fisher's area, in terms of if we can figure out and get our governmental partnerships to think in terms of making its choices in the safety criteria, in terms of technologi-

cal market share, and making gains, and how those processes could also apply to general construction, the battery issue, for example, vehicle batteries.

Dr. Fisher, you mentioned getting money from DOE. Has there been any EPA involvement in that? Was it Dr. Fisher? No, Dr. Simon. Has there been any EPA money tied in with it? It seems to me EPA with all its——

Dr. SIMON. The answer is negative.

Mr. HENRY. Negative. Wouldn't that be an obvious one for EPA to tie into in terms of industrial partnership?

Dr. SIMON. We think EPA could be a partner in a number of future R&D endeavors. The battery one right now is pretty well in shape, but obviously that is a candidate for future R&D partnerships.

Mr. HENRY. I have one question I would like to put to the three panelists. Are some of us thinking along the right lines, of taking the R&D money which is in the Surface Transportation Act which is set aside for DOT for research, and trying to get that research focused on manufacturing competitiveness, technology issues as they align with safety? Would you care to comment on that?

Dr. LAW. I don't know the answer to that, sir.

Dr. FISHER. I think it can't help but be beneficial, if we can do more to try to bring some of these technologies in areas you have mentioned like aerospace, where there is a lot of technology development—I think we have a problem in general on transferring some of these technologies across distances.

There are things that are being developed that should be applied in a conventional structure that undoubtedly have been applied in the past. We are not doing enough of that. I think that will only be accomplished with more interdisciplinary efforts, though.

Dr. SIMON. I think my opening statement made it very clear that we need a paradigm shift in how we do our R&D in the future. I think I have made it very clear in my opening statement that I believe companies like mine need to learn how to work together with all the Federal agencies, and that if we work together, leverage our tremendous resources, both private industry and Federal resources, that we can once again become a world leader in many technologies.

Certainly General Motors would have no objection to working on R&D partnerships with the Department of Transportation in the areas I mentioned in my opening statement. Certainly we would encourage that kind of relationship.

Mr. HENRY. It would fit perfectly with Michigan's transportation research facility. But it would take you away from looking at it simply in terms of safety functions, looking in terms of trying to find a manufacturing technology equivalence that would have safety impacts of comparable value.

Mr. Chairman, my time is up. What I would like to do is, I have six questions which I have prepared that I would like to submit to the three witnesses and ask if they would be generous enough to give us written responses. That would also give you time to reflect a bit longer, and that the questions and responses be entered into the record.

Mr. VALENTINE. Without objection.

Mr. HENRY. Thank you, Mr. Chairman.
[Material to be inserted follows:]

The American Society of Mechanical Engineers

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July 24, 1991

Dr. James Greene
Special Assistant
Subcommittee on Technology & Competitiveness
B-374 Rayburn House Office Building
Washington, D.C. 20515

Dear Jim:

The enclosed document is our response to the Republican members questions submitted to witnesses at the subcommittee's June 4, 1991 on Surface Transportation R&D Needs hearing.

If you require additional information, please let me know.

Sincerely

Nelson L. Milder
Assistant Director
Policy Development and Technical Support

The American Society of Mechanical Engineers

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RESPONSE OF THE ASME COUNCIL ON ENGINEERING TASK FORCE ON TRANSPORTATION R&D NEEDS TO REPUBLICAN QUESTIONS AT LEGISLATIVE HEARING ON SURFACE TRANSPORTATION JUNE 4, 1991

1. **Do you think that the U.S. Department of Transportation (DOT) should fund long-term research on automotive technology that could enhance U.S. competitiveness?**

Yes. Currently, automotive companies are the principal providers of this type of research. European and Japanese manufacturers are leading the way into the next generation of automotive products, such as drive-by-wire systems. These systems integrate many of the current stand-alone systems such as anti-lock braking, four wheel steering, traction control, etc. Also, Japanese industry and universities seem to cooperate more strongly in the R&D that paves the way for such products.

Presently, very little funding is available in these areas to independent and university researchers. The National Science Foundation (NSF) generally views these topics as too applied while agencies such as DOT view them as outside their sphere of responsibility. Consequently, the automotive industry is generally the only source of funding for outside researchers. This at first glance seems appropriate. However, we need to realize that the level of research invariably decreases when the industry is faced with poor car sales - which, in part, may be attributable to non-competitive products. Support for R&D is therefore unstable. Lack of or inadequate support for R&D in these technologies leads to non-competitive products which in turn leads to industry losses, which then further leads to decreased R&D.

It may also be instructive to consider the example of the U.S. aerospace industry. [illegible] industry is the world leader. Exports of airliners and engines made in the U.S. contribute favorably to the balance of payments. Most, if not all of the U.S. aerospace manufacturers that market civilian products also have a substantial stake in the defense industry. Their technological base that supports their efforts in civilian products thus depends in large part on federal support of their defense segments. By extrapolation, one could argue that increased federal support for automotive R&D could, in the long term, substantially improve the competitiveness of our automotive industry.

Another example is the old National Advisory Committee for Aeronautics (NACA), forerunner to NASA. In the late 1950's and early 1960's, NACA reports were extensively used as textual and supplementary material in undergraduate

aeronautical engineering courses. This was not only in courses such as aircraft performance and design but also in more fundamental courses in propulsion and aerodynamics. Thus, a federal agency contributed strongly to the growth of aeronautical engineering in the U.S. not only by supporting industrial research but by conducting much of the research that was to serve as the foundation for the field in education.

To the best of our knowledge, there are no "Departments of Automotive Engineering" in U.S. universities, yet there are many Departments of Aerospace Engineering. This is certainly not the case in Europe, where for example, Germany, the Netherlands, England, Austria and Sweden have strong university programs in automotive engineering. This is cause for concern when one considers the capital devoted to automotive products in the U.S.. Our aerospace industry is generally healthy, our automotive industry is struggling to regain its competitive connection. There may be a lesson to be learned here. It is possible that federal funding may be profitably spent in supporting university initiatives in this area.

2. **Should DOT work cooperatively with industry and university scientists in long-range research programs to develop the next generation automotive technology?**

Yes. Our response to question 1 generally addresses this issue also. The U.S. seems to have cultivated a more adversarial relationship among government, industry and universities than exists in Europe and Japan. It should be noted, however, that we have not investigated the DOT programs in order to assess whether or not such cooperative ventures are in place within the Department.

3. **Would a Science Advisory Committee be beneficial in helping DOT evaluate its current automotive and transportation R&D needs?**

Such Advisory Committees have been used effectively for other federally funded R&D efforts; however, we are not now in a position to comment authoritatively on whether or not such science advisory groups have been or are now in use at the DOT.

4. **Should the DOT conduct long-term, high risk research in:**

a) Transportation Infrastructure

As this is primarily a construction and right-of-way development issue, we suggest that questions regarding the need of federal R&D support for transportation infrastructure research should be directed to the American Society of Civil Engineers.

b) High Speed Rail

As we testified at the hearing, we have lost our chance here and are twenty years behind. Europe and Japan are the current leaders. We need to have the expertise to be intelligent consumers and users of their products. However,

it is our view that putting money into R&D in this area, specifically into R&D that would serve as the basis for design and manufacture of high speed rail systems is money that could be better spent elsewhere.

c) Automotive Technology

Yes. If we don't do something fast - across the board - i.e., into R&D technologies that lead to better products and into the means for producing these products (i.e., manufacturing technologies) and into reducing the time required to incorporate innovations into our products - then our automotive industry may fail to be competitive with foreign industry (despite recent and continuing strides made to narrow the gap).

As a general comment, transportation system research should use an integrated, total systems approach. To support research in one part of the system at the expense of another (e.g. transportation infrastructure as separate from highway vehicle research) would weaken the overall value of the research investment.

d) Desirable levels of funding

Without a definite program plan, the level of federal R&D funding needed cannot be adequately addressed.

Questions 5 and 6 which focus on reports of the Office of Science and Technology Policy and the Office of Technology Assessment regarding national critical technology and public work technologies respectively have not been reviewed by the ASME Task Force. It would therefore not be appropriate for us to comment on them. However, as we have stated in our testimony before the subcommittee, research in the areas of intelligent vehicle/highway systems will be especially important in the future, and there should be a federal commitment to support such R&D.

This statement was prepared by a task force of the Council on Engineering of ASME. It represents the considered judgement of the task force, a group of engineers with expertise in the field, rather than an official position of ASME.

Mr. VALENTINE. The Chair would like to thank the gentleman for his usual insightful statements, and I have some follow-up questions. But before that, I want to recognize the distinguished Ranking Member of the Full Committee, the gentleman from Pennsylvania, Mr. Walker.

Mr. WALKER. Thank you, Mr. Chairman. I had some questions for Mr. Simon. I had read his testimony in advance, and he had a couple of interesting points in there, some things that I have been working on. You mention in your testimony that you feel Government labs ought to become involved with industry in some of the work that you are doing. Are there any particular Government labs that have a particular set of skills you would like to see industry get access to?

Dr. SIMON. Yes, Mr. Walker. To begin with, I believe that first of all, the nine DOE labs and NIST, together with Wright-Patterson Air Force Base, have some tremendous material technology. Material technology, for example, that we need for future vehicle programs, and they also have some tremendous manufacturing technology, especially precision machining, for example.

But advanced materials such as carbon fiber, carbon carbon—some of the technologies that have been used for aerospace—down the road we see that we have to learn how to integrate that kind of technology into our future vehicles. But there is also all kinds of expertise, other than just advanced materials. I think the National Critical Technologies Panel—the kinds of materials that are identified there, are really the same kinds of things General Motors is looking at for the future. I think the nine DOE labs, NIST and Wright-Patterson Air Force Base are just golden nuggets of American technology that we need to learn how to work with.

Mr. WALKER. I thank you for that. That is helpful. I was recently out at Sandia in New Mexico, and they are doing some robotics work out there in the manufacturing field that I think would help to revolutionize some of what you are looking to do in the future. So I believe there is merit in what you testified to.

Are there any specific legislative or policy changes that you know of that would help bring about greater Government-industry cooperation? I would appreciate all the witnesses responding to this.

Dr. SIMON. My only comment is, I guess, first of all, I can only comment toward the technology transfer area. I think the legislation we now have in place through the Federal Technology Transfer Act and the National Competitive Technology Act of 1989, gives American industry a clear-cut opportunity to work together on precompetitive generic technology that we need for our future programs.

And frankly, I have had nothing but positive responses so far, and I think you have paved the way through the legislation to allow us to see if we can't form these partnerships. I really don't see in the area of needing any future legislation as far as in the area of technology transfer. That's the area I think I would like to limit my comments to at this time.

Mr. WALKER. Do either of the other two gentlemen have any things they know of on the legislative front that we ought to be looking at?

Dr. FISHER. Nothing that I can think of. I think the encouragement you have given in research centers' involvement with industry and things of that nature that have been done in the past have been very beneficial.

Mr. WALKER. So if we simply build upon this structure that is now in place in terms of getting the cooperation in place, that is probably the best thing we can be doing right now?

Dr. FISHER. I believe that would be true.

Mr. WALKER. In a recent automotive news article, Mr. Rynkle, the GM Vice President for Advanced Engineering, stated that he feels Government and industry are working at cross purposes when it comes to the health of the domestic automobile industry. Are there any examples you may be able to cite of that, Dr. Simon.

Dr. SIMON. Do you have all day? [Laughter.]

I can only say a few things. First of all, I believe that the Government's approach is sort of based on the premise that industry cannot be trusted and that industry's feet must be held to the fire in order to accomplish our societal objectives. I would say that the CAFE law and the Clean Air Act are based on the premise that technology can be forced on the market and the industry can be forced, through things like recalls and penalties or lawsuits, to deliver technological solutions that meet environmental objectives without it adversely affecting consumers.

That's one example. Again, meeting environmental safety and fuel economy mandates, Mr. Walker, makes extraordinary demands on our financial and technical resources, it makes it more difficult for us to focus our resources on getting ahead competitively. You know what kind of competitive global climate we are in right now.

I don't want to go on, but these are just a couple of examples.

Mr. WALKER. If you have some others, it might be useful for the record. I would ask if you would submit those to us.

Dr. SIMON. I would be pleased to submit additional examples for the record, yes.

Mr. WALKER. Also, he mentioned in the same speech that there are some technologies that need to be targeted. I think he mentioned specifically engineering fuel cells, catalysts that work at low temperatures, and intelligent vehicle highway systems. If you would have a list of other example of that type, I think it would be useful for the committee to have that.

Dr. SIMON. I do have, and will readily submit that for the record.

Mr. WALKER. Thank you very much. And also, while I think all of us would agree, certainly from my perspective I would agree, that we don't want Government designing automobiles. I would hate to think what we would get out of that. We certainly would not get anything that looks like my Corvette.

But in the aviation field, we have found in the past that sometimes putting together prizes that are awarded for achieving certain milestones help move forward aviation technologies. I would appreciate the reaction of the panel to that as an idea in the automotive field, whether or not, if we set a prize structure and awarded them to individuals within companies, or awarded them to individuals in Government labs and so on, would that advance the

state of automotive design, performance or engineering? Would that have a beneficial impact? Dr. Law.

Dr. LAW. There are some programs like that in place. In fact, I think there are several programs sponsored through another society, the Society of Automotive Engineers, that focuses on various types of vehicles, and encourages student groups, for example, to do that. That is somewhat different from what you are addressing. I think you are addressing more top line engineering type approaches to problems.

I think it can help, I think it's not the only answer, but certainly it is worth considering.

Mr. WALKER. Okay. Dr. Fisher.

Dr. FISHER. I don't think I'm qualified to answer that.

Mr. WALKER. Okay. Dr. Simon.

Dr. SIMON. I think General Motors would support this. The Malcolm Baldrige Quality Award certainly focused America's attention on quality, and if we could have the same kind of award that would focus attention on the design aspect, I think it would be a very positive thing.

Mr. WALKER. Thank you. Thank you, Mr. Chairman.

Mr. VALENTINE. Thank you, sir. The Chair recognizes the gentleman from Indiana, Mr. Roemer.

Mr. ROEMER. Thank you, Mr. Chairman. Thank you gentlemen for your insightful and good testimony today. One of the things I've talked about along with a number of my colleagues on this committee has been a reinvestment in America, a reinvestment in a martial plan to rebuild this country, whether it be the bridges and roads, whether it be the educational system, whether it be our competitiveness, especially for small businesses. Many of these ideas have been talked about in different ways by the gentleman from Michigan and the Chairman, when we mention technology and innovation and competitiveness in the world and getting better cooperation between our federal labs and bringing about the development side of the R&D.

One of the questions I have, Dr. Law, would be that we have talked and had hearings on the magnetic levitation train. We really have not discussed in a lot of detail yet the high-speed rail. Should the United States be involved in research and development on the high-speed rail? To what degree should they be, if you say yes to the first one? And can you do any kind of comparison of where we are with other countries in this area?

Dr. LAW. Yes. High-speed rail is a rather interesting area. In the 1960s and 1970s our country started to make good strides in that area. You may recall that it was a time of optimism with regard to surface transportation in general, and high-speed rail was one of the facets for a solution to problems in that area.

In fact, we started to build an R&D base, we started to build a production base. There was, you may recall, what was then called United Aircraft Corporation, who built their turbo train, which was eventually marketed to Canadian National Railways, and was installed in another version on the Boston to Washington run.

So there were significant efforts in that area. We started to build the base, we started through sponsorship of federal agencies to sponsor research at the universities, we started to graduate people

who were trained in areas of railroad technology. Our efforts started to be recognized on the world scene. Our researchers were well thought of on the world scene and presented papers at international conferences. I myself was involved in developing a short course which was given in Germany, Sweden, and Canada as well as the U.S. foreign research establishments sent their young engineers to that course.

I think what happened, at least from my own perspective, is that there was a real rush to put some of these systems that were developed at home into practice without adequate development time. They ran into what, in hindsight, were problems that should perhaps have been foreseen. However, I think at some point in the process—and again speaking from my personal viewpoint—we lost the will to proceed with those.

We lost the opportunity to learn from the problems we encountered with those systems, and essentially opted out. What happened on the R&D front was that the job opportunities for engineers trained in this area gradually went away. The focus in the U.S. shifted entirely to freight, and there is still a capability in rail research on freight systems.

But right now, today, there is not the capability in place for R&D in all the various facets of high-speed rail operations, at least to my knowledge, there is virtually no research being conducted in high-speed rail per se, the problems that are specific to high-speed rail, at U.S. universities.

I think, again speaking personally, that high-speed rail can play a significant role in solving some of our transportation problems in densely-populated corridors. But right now, if we want it in the near term, we have to go out and buy it from some foreign supplier. We do need to be intelligent as consumers of that in the near term, so we will need to have some technological capability for monitoring contracts and so forth. If we want to become players in that a little further out, we have to start building that R&D base again and have a long-term commitment to build an R&D base and a production base.

Mr. ROEMER. I just want to take a step back as well. In an earlier hearing we heard that we had also developed the original base for the magnetic levitation train at Brookhaven and lost that as well.

Dr. LAW. That's true to my knowledge, yes.

Mr. ROEMER. So what does this mean, Dr. Law? Is this something you are concerned about, that we cannot catch up now, that we have lost this ability to compete, to retain jobs in these areas, to keep that sector of that industry healthy in this country? How much does that concern you?

Dr. LAW. It does concern me. An interesting point came up in the deliberations of our task force on just this issue. If we look at the Japanese auto industry 20 or 30 years ago, it really was producing inferior products. Today I think Japan has on the order of 30 percent of our market. They built—however they did it—they built up to that share, and I think their efforts are recognized as resulting in very, very good products.

Now I think if we want to be 20 or 30 years from now in the position of being a leader in high-speed rail, first of all we have to make a long-term commitment to it, and we have to establish the

kind of commitment that industry can take and say yes, we can become players in this market, and we can develop these systems, and we can be profitable players in these systems.

Mr. ROEMER. And it's not too late?

Dr. LAW. Well, it's too late for the near term. If you want one five years from now, I think we are going to have to buy foreign technology and install it. But I think we can build on their base and take what capabilities we have, and go from there and build up. That's really a policy issue, and I am speaking from my own personal opinion, but I think it's a policy issue that needs to be addressed. Speaking for myself, I think it is possible to do in the long term, and build that back up. But for the near term, I think we would have to buy our equipment from overseas.

Mr. ROEMER. Dr. Fisher, along another line, unless you wanted to comment on any of that at all——

Dr. FISHER. Well, there is one point I would like to make in conjunction with high-speed rail. We must realize that the high-speed rail has to cross structures. And structures do not behave the same under high velocity and the frequency responses. This has been borne out by the Japanese experience, in their high-speed system they have had quite a bit of stress because of the high frequency induced vibrations that have created cracking problems.

I think when we look at some of these technologies it would be a mistake to think that we can implement them without having some technology development of our own. We will make the assumptions, as we have sometimes done in the past, that we know how to apply that technology in other aspects. And I think that's a dangerous route to proceed on.

So I would concur there is a need to develop some of this technology here. We cannot as a Nation that is supposed to be among the leaders of the world—we have got to develop some of this technological capability right on our own shores. And we will not do it buying it from abroad.

Mr. ROEMER. I agree. And on another line, since Congressman Ritter said that you were such an expert on everything, and I believe that, you mentioned in your testimony that you had studied different cracks and certain types of bridge structures, and we are now reading that across the United States that one in three bridges is either in need of repair or is going to fall down in the next 10 or 15 years, that we have a very, very serious problem there.

What are the results of your studies, how are you disseminating that information? Are there some structures we need to be more concerned about in the near term, and how are we going about addressing that? And secondly, when you address the need for producing new materials and new R&D to ensure performance and durability, can you talk a little bit about some of that material and how it would save us money in the long term? Would new types of cement for structures do that as well, too?

Dr. FISHER. Well, in conjunction with the safety and reliability, I think we have learned a lot in the last 20 years. It has been because of this trial and error process that has evolved. We built the systems and now they have developed cracks, there is no State in the Union that I know of that does not have distress of some sort, a

lot of it because the mathematical models or design concepts were not adequate at the time, 20 or 30 years ago.

Today I think we do have the technology and we are moving to correct that. But part of this is education, and a need to educate those who have gone through our system in the past. Because engineers sometimes tend to get into a rut and follow the mistakes that have preceded, and do not make the corrections on a prudent course.

I think unfortunately we have had some major catastrophes, and those major catastrophes, when the Minannis River Bridge collapsed in 1983, and the Schoharie Creek Bridge more recently in 1987, each of those had a technological problem behind it. In the case of the Minannis River Bridge, you had severe corrosion that was not detected that caused geometric change and under the repeated loads cracks formed that were not found. Finally, in an instability condition, it collapsed.

Similarly, in the Schoharie Creek collapse, flood waters washed out—we did not have any gauges installed to detect movement. I think there is some movement today and there is recognition of focusing on these. But I guess in the transportation system, major events like that have had to occur, unfortunately, before we have responded to the technological challenge. That is a problem I think we need to focus more on. I think the Federal Highway Administration, for one, and others, are more appreciative of those issues today and do take steps in a fairly rapid way to deal with these safety-related issues. Hopefully that will continue.

In the new materials, as I look to the future, a number of problems have surfaced because of the inability to fabricate a quality product. For example, some of the quenched and timbered steels that were applied to bridge structures in their first development in the 1960s and 1970s, the inability to fabricate those without cracks was not really well understood. I think these new materials, the advanced processing steels, the microalloy steels today, are materials that are easily fabricated, and do not have those difficulties associated with them.

Unfortunately, the advanced processing technology we don't have in the United States. The Title 3 program is intended to transfer that from Japan back to the United States. I think it will only succeed if we can broaden the market for that material so that it is useful not to just defense. I think it will only succeed if we can create the markets and putting it into bridge structures, putting it into ships, commercial fleets and others. That's when it will succeed, because the market will be there, and our steel industry will respond to it. Otherwise, I am skeptical that it will.

Mr. ROEMER. Thank you.

Dr. Simon, if I could ask you, you mentioned the Technology Transfer Act before, in regard to Congressman Walker's question about trying to help foster and expedite the transfer of technologies from our federal labs to the private sector, and try to get better cooperation between the two. Do you have any recommendations as to further improvements in the Technology Transfer Act or any other creative, innovative ideas that you can suggest to the committee to improve the cooperation in getting us more competitive with the Japanese and the Germans in these different areas?

And you also mentioned in your testimony some barriers that the auto industry has to relate to in this country, and that the Japanese do not. Are you referring to, in that instance, antitrust laws, and reforms in those antitrust laws?

Dr. SIMON. Let me take the first area first. I would maybe start out by letting you know that I am still a neophyte in this area. We are in a "getting to know you" phase of working with federal laboratories. But as I told you in my work in facilitating the U.S. Advanced Battery Consortium, primarily that was the bulk of my work in this past year. So I am still learning, working with the federal laboratory system.

I think the legislation is in place that allows companies like mine to work with the federal laboratory system. However, there are some things that I mention in my testimony that would be a big help. For example, the National Center for Manufacturing Sciences has been trying to get an MOU signed for over a year with the Department of Energy. So there are many companies waiting to work within NCMS. These are small companies that maybe don't have the luxury of being able to visit laboratories like I am able to do.

So the time it takes to get some of the agreements signed, typically it takes three to six months, in my experience, to get something signed. American industry cannot wait three to six months to get paperwork signed. We have to be more responsive. These are things that I don't think it takes legislation to do, as much as people like me, eyeball to eyeball with administrators from the federal labs saying it is totally unacceptable to wait three to six months for things to be signed. You lose momentum when you have researchers from federal labs and from industry ready to work together and then there is this long delay. The momentum is lost and in some cases it is fatal.

Let me just tell you, I am still in the getting to know you phase, and they are getting to know me. I think where American industry now needs to learn—you have paved the way, and I thank you for paving the way with this legislation that allows us to do our job now and to be able to work precompetitive generic technologies with Federal laboratory systems. I think we need to learn how to use the present system more effectively before we go on to needing something totally different.

In the area of antitrust, again right now, General Motors has not had any problem with antitrust since the National Cooperative Research Act of 1984. We know that we can safely work on precompetitive generic R&D and we are doing so, and we really have not, although I am not a lawyer by training, General Motors has not had a problem in this area. I think the U.S. Advanced Battery Consortium is testimony to that, because it was a very complex process, and again we had complete backing from the Justice Department on this venture as well as other Government agencies.

Mr. ROEMER. Thank you. Thank you, Mr. Chairman.

Mr. VALENTINE. Mr. Ritter.

Mr. RITTER. Thanks, Mr. Chairman. I would like to query Dr. Fisher on a few things. Given the size, the scope, the investment in our highway infrastructure and highway bridge infrastructure, do we do anywhere near the proportionally needed research and de-

velopment in this area? It seems to me it is almost a researchless and developmentless field, where you kind of do something and find out if it works, and then you do it next time a little differently. Would you want to comment on that?

Dr. FISHER. I think it is a very low percentage that is devoted to research. I think in the HPR funds, the Highway Planning and Research, unfortunately in my view, too much is used for planning and very little for the other activities. So many States, although the legislation was written to encourage it, unfortunately I think very little is really focused in the research area. So much more of it is put into planning, rather than into the research arm. So I would agree with you that there is an inadequate amount of resources that has been directed in the past.

Mr. RITTER. Are we missing a high-tech, new tech boat? Do we practice quality principles of continuous improvement? Are we in one of those industries here which has always been domestic, never faced international competition, and maybe all of a sudden we are going to get hit with it right between the eyes, because other countries are developing major new techniques and technology for laying down roads and erecting bridges?

Dr. FISHER. Well, I don't think it's altogether that, although I think there is some of that. Certainly in some areas we have been lagging. We tend to wait until some of this is done elsewhere, then when we grab hold of it, we don't do it very well.

I think the electroslag process that you are probably familiar with that evolved in Russia, when we brought it to this Nation, we did almost nothing as far as R&D, we put it into practice, and then we had to throw it out because of the bridges cracking in Pittsburgh.

That s one of the difficulties. We tend to have had too short-term a focus. If there is any criticism I have of the Federal Highway Administration, I think a lot of it has to short-term a focus. There is not much effort devoted to the future.

Mr. RITTER. So the greater amount of the Highway Trust Fund should be going into a longer-term R&D approach to our Nation's infrastructure, is what you are saying.

Dr. FISHER. I would agree with that, yes.

Mr. RITTER. The Chairman talked a little bit about the U.S. heavy equipment manufacturers. Maybe that's a subset of the question about how much time it takes. We are going nuts, all of us, in watching the repair and rehabilitation of our road systems as we have to travel back and forth to work. There has to be a better way.

Are we still back in the beginning of the 20th century when it comes to technology and technique? We grind it up, crush it up, bring the truck in with the concrete. Aren't there ways to automate to create a new generation of technology and technique to repair infrastructure, particularly as the demands on our roads and highways increase? We are still doing it the same way we have always done it, 50 years ago, yet we have 5,000 times as many cars on these roads.

Dr. FISHER. The SHARP program was intended to deal with some of this, and the fact that in the cement industry there was no R&D, it evaporated, and that program which Congress did pass and put

in line the past few years in an attempt to improve the quality of the materials going into the highway system, and there is associated with that the performance, the design criteria.

A lot of it has evolved from the late 1950s and 1960s from what was called the axial road test. There are some road tests now that are trying to produce this durability and reliability which is related to the heavy loads. Although I supposed in some sense, as he has pointed out, it is the axial load, the wheel load, that has the more critical performance on highway pavements, rather than the total load.

On bridges, the total loads—it depends on the span length, the consequences of it. But I think those can be dealt with analytically. I think there are needs to deal with these new materials, and hopefully the R&D program would not do it on such a trial and error basis as we look to the future.

Mr. RITTER. Is there a possibility of automating, with some of the intelligent systems we have, automating some of these repair functions? You mentioned that we are almost not even a player in these new heavy equipment, more intelligent systems, more automated systems. Isn't that disturbing, since we have probably the most extensive infrastructure, certainly with highways and bridges, of any country in the world and probably all of them put together?

Dr. FISHER. I think for the long-term it is. I am not sure for the short-term. Even the Japanese, although they are investing greatly in these, when I was in Japan last summer, the robotics that I saw on site were very little. They admitted at the time that it really was not more economical at the present time.

But I think they are looking at their demographics in the next century. So they are taking a longer term view and are willing to do this on an R&D basis now. I don't think in the United States—at least I have not seen any evidence—that we think that far ahead. And I think——

Mr. RITTER. Do our highway planning departments work according to total quality principles at all? Is anybody thinking in terms of continuous improvement? Or are we just still at the phase of "if it ain't broke, don't fix it, when it breaks, fix it"?

Dr. FISHER. No, I hope we have moved beyond that degree. I think we are making some strides in there. Undoubtedly in some places there are still failures to deal with that, to ensure quality. Otherwise, some of these fixes that you have mentioned would last longer than they are lasting today.

There is certainly some of what you have indicated there. But I think there has been recognition of that in the highway industry, and the industry is trying to do something about it. I think one of the problems is what we see today, when the States get into financial problems with rebatable resources, which is happening quite a bit right now, then maintenance and deferring things that should be dealt with is the first thing that happens. I see that as still being an ongoing major problem in the country.

Mr. RITTER. Dr. Law, I was just reading an article in the New York Times about the Bundesbahn buildup of massive debt. As someone who believes that the United States must go towards high-speed rail transport one way or another, we are going to have to have trains, planes and automobiles, anything we can get, to get

ourselves around without getting stopped and jammed between destinations.

How do you answer the question as to whether or not the United States should be developing our own domestic industry in high-speed rail, or are we so far past the point of getting into this that we would just be better off dealing with the foreign suppliers? I know a fraction of the marketplace is already doing that, because in Texas they are obviously going to buy what's available for the Houston-Dallas run. But what are your thoughts there?

Dr. LAW. It is difficult for me to respond to that, because it is really a financial issue that is not my direct area of expertise, as to whether it makes more sense economically to do one as opposed to the other.

Mr. RITTER. That's a question we are going to have to answer here before we start pouring money into trying to catch up with countries that have been in this game for 25 years.

Dr. LAW. That's true. It needs to be answered. My personal feeling is that for the long term we have to have high-speed rail in our densely populated corridors. And I don't see them getting——

Mr. RITTER. Made in America high-speed rail?

Dr. LAW. That's the issue you are raising. I am really no expert in the finances of those issues to answer that. I think in terms of the technical quality, we can be players. I think in terms of the technical quality of the high-speed rail, given the resources we can do it. I am not qualified to answer whether it makes sense economically to do it.

Mr. RITTER. One of the people in the field mentioned that it would take about $1 billion to get into this, in that New York Times article. In the meantime, I was looking at the numbers and the Bundesbahn was losing several times that much in a manner of months. This is sort of like trying to get back into the automobile age after having ignored it. I don't know.

Mr. VALENTINE. If the gentleman would yield, let me ask Dr. Law this. Since high-speed rail transportation, as far as I know, exists only in Europe and Japan, if we have a need to develop that type of transportation here, why isn't it the practical and proper thing for us to seek Japanese and German technology? Whereas, if we continue R&D, we put tax money into a system that we can give no indication of using, aren't we just doing the research for them?

Mr. LAW. There is that potential, it's true. I guess the issue is long term, there are two points. One is, do we need something like high-speed rail, some sort of high speed surface transportation? I think you can make a good case for it on technical grounds. The second issue is, where do we get it?

Ancillary to that second issue is the issue of does it have to pay for itself? We talk about the Bundesbahn losing money. Do we talk about a skyscraper losing money on the operation of its elevator? The elevator is necessary to the functioning of the skyscraper. I think high-speed rail and systems like that are necessary to the functioning of our country.

Does it have to make money on its own, or do we pay for it out of resources allocated to—to pursue the analogy—the functioning of the skyscraper, in this case the country? I think that's an issue

that is perhaps overlooked. But again, I am certainly not an expert in economics, so I can't address that. All I can say is that in the near term, if we want high-speed rail in the near term, we are going to have to get it from overseas.

If we put money in R&D, some of that know-how will be going overseas. But at the same time, if we are going to be consumers of high-speed rail, we have to be intelligent consumers. And in order to be intelligent consumers, we have to have some technical basis to judge the quality of these systems, and to maintain and operate them.

There are different levels of R&D support implied in that issue as compared to planning to become a producer of high- speed rail systems. I think they are separate issues.

Mr. RITTER. So in other words, we should be quite cautious as to where we expend resources here. Obviously there are niches all over the place, when you are dealing with a major new transportation system. We probably should not be trying to reinvent somebody else's wheel, or doing research on the wheel that has already been invented.

Dr. LAW. In fact, there is a lot of technology that is out there. It's like a library. There is a lot of information in the library, and given sufficient time, all of us can go in and read the materials in the library and become experts in fields we want. There is a lot of published information out there, there is a lot of experience out there. Given sufficient time, our people can become conversant with it.

Mr. RITTER. But you would not advocate a crash R&D program to try to get the U.S. going on high-speed rail?

Dr. LAW. Speaking for myself, no.

Mr. RITTER. Thank you, sir. Thank you, Mr. Chairman.

Mr. VALENTINE. Thank you, sir. The Chair recognizes at this time the distinguished lady from Maryland, Mrs. Morella.

Mrs. MORELLA. Thank you, Mr. Chairman. I would like to ask unanimous consent that a statement with regard to this hearing be included in the record.

Mr. VALENTINE. Without objection.

Mrs. MORELLA. Thank you.

[The prepared opening statement of Mrs. Morella follows:]

CONSTANCE A. MORELLA

SST/T&C SUBCOMMITTEE

SURFACE TRANSPORTATION HEARING

JUNE 3, 1991

THANK YOU MR. CHAIRMAN. TODAY THE SUBCOMMITTEE IS EXPLORING SEVERAL AREAS OF IMPORTANCE AFFECTING THE FUTURE OF OUR SURFACE

2

TRANSPORTATION SYSTEMS: HIGH SPEED RAIL, AUTOMOTIVE SAFETY, INFRASTRUCTURE, AND LEGISLATION ON SURFACE TRANSPORTATION RESEARCH.

ACCIDENT RATES ON OUR NATION'S HIGHWAYS ARE STARTLING. IN FACT, TRAFFIC ACCIDENTS REPRESENT THE SIXTH GREATEST CAUSE OF DEATH IN THE UNITED STATES. CLEARLY, THIS REVEALS THE NEED TO ADDRESS THE SAFETY OF OUR CITIZENS AS

3

WE PROPOSE FUTURE TRANSPORTATION SYSTEMS. THIS SHOULD, THEREFORE, BE A FOCUS OF FUTURE RESEARCH AND DEVELOPMENT.

HOWEVER, DESPITE ITS PRESENCE AS A MAJOR PUBLIC HEALTH PROBLEM, FEDERAL FUNDING FOR HIGHWAY SAFETY RESEARCH CURRENTLY FALLS FAR BELOW OTHER HEALTH THREATS. HIGHWAY SAFETY RESEARCH CURRENTLY RECEIVES $49 MILLION IN FUNDING, COMPARED TO $812 MILLION FOR CANCER

AND $377 MILLION FOR HEART DISEASE. ALTHOUGH, ENFORCEMENT OF DRUNK DRIVING AND SEAT BELT LAWS ARE ENCOURAGING, I BELIEVE WE CAN GO FARTHER TO REDUCE TRAFFIC FATALITIES, BY FOCUSING ON DRIVER PERFORMANCE.

ALONG WITH SAFETY, AS THE POPULATION INCREASES, THE CONVENIENCE AND EFFICIENCY OF OUR TRANSPORTATION SYSTEMS BECOME ESSENTIAL IN AN EFFORT TO MOVE U.S. TRANSPORTATION SYSTEMS

COMPETITIVELY INTO THE FUTURE. IN RECENT YEARS, TRAFFIC FLOW HAS INCREASED SIX PERCENT, ALTHOUGH THE NUMBER OF ROADS HAS ONLY INCREASED BY ONE PERCENT.

WE HAVE PREVIOUSLY HEARD TESTIMONY REGARDING MAGNETIC LEVITATION TRANSPORTATION SYSTEMS AND THE INTELLIGENT VEHICLE HIGHWAY SYSTEMS (IVHS) AS A MEANS TO ADDRESS THIS PROBLEM OF TRAFFIC CONGESTION. TODAY I LOOK

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FORWARD TO HEARING ABOUT THE POSSIBILITIES FOR A HIGH-SPEED RAIL SYSTEM AS A MEANS OF EFFICIENT INTERCITY TRANSPORTATION, SIMILAR TO THE ONE BEING DEVELOPED IN EUROPE.

I UNDERSTAND FROM OUR PREVIOUS HEARINGS THAT A U.S. RESEARCH AND DEVELOPMENT EFFORT INTO THIS HIGH-SPEED RAIL SYSTEM WOULD BE MORE COST-EFFECTIVE THAN PURCHASING A SYSTEM FROM MEMBERS OF THE EUROPEAN COMMUNITY. HOWEVER,

7

BEFORE MOVING INTO A NEW SYSTEM OF SURFACE TRANSPORTATION, WE MUST EXAMINE THE RISING COSTS AND DELAYS IN THE CONSTRUCTION OF OUR CURRENT HIGHWAYS AND RAILROADS. RESEARCH AND DEVELOPMENT INTO OUR CURRENT INFRASTRUCTURE IS ESSENTIAL AS WE MOVE TOWARDS THE FUTURE.

I'D LIKE TO THANK OUR WITNESSES FOR COMING TODAY. I LOOK FORWARD TO HEARING THEIR TESTIMONY AS WE PREPARE TO DRAFT A SURFACE

8

Transportation Research and Development Bill.

Mrs. MORELLA. I'm curious—picking up on what I have been listening to with regard to the research and development, I am curious if the Department of Defense, for instance, has done a lot of R&D work with regard to surface transportation, the new Jeep, etc.

Can you suggest ways, or would you give us any examples of how it is being used in terms of technology transfer, or can be used in terms of technology transfer, to the private sector, so that we can be competitive? That's directed to all of you.

Dr. SIMON. Mrs. Morella, maybe I can ask for a clarification before I answer. Are you asking if there are technologies that are used in defense programs that can be transferred——

Mrs. MORELLA. I am wondering if they are being transferred.

Dr. SIMON. You're wondering if they are——

Mrs. MORELLA. If they are in fact being transferred to the private sector, or whether that R&D is kept in a vacuum. Maybe they are, if you don't have an answer.

Dr. SIMON. Well, I can only make one comment. I really have to think about this and prepare a written response, but my experience so far, as I explained in my opening statements and all the questions I have answered so far, General Motors is still somewhat of a neophyte as far as working with our federal labs and are in the phase of getting to know you, and we are right now confining our activity to NIST, the nine DOE labs, and Wright-Patterson Air Force Base.

We do see some great technology at Wright-Patterson Air Force Base, and in our getting to know you phase we see advanced materials, manufacturing technology, carbon fiber technology, ceramic technology, metal matrix composite technology—these kinds of things that we think down the road can be helpful to our business.

Our Hughes Aircraft subsidiary of General Motors obviously has a long-standing working relationship with the Defense Department. Our Allison Transmission and Gas Turbine Division likewise has a long-standing working relationship with the Department of Defense, and would be far better to answer that. But I do know that it is a very positive working relationship, and there are things that are being learned from Defense programs that obviously are finding their way into cars and trucks and other programs.

But I am not the right person—for the record I would be glad, if you are interested, to get that into the record.

Mrs. MORELLA. It sounds promising, and I would be curious about in the getting to know you phase whether you had to make the introductions or whether it was offered to you, and who started which. This committee would like to hear more about that.

Dr. SIMON. I actually said in my opening statements, I really had a wonderful opportunity to spend over a year in the White House Science Office and really had a chance to be in many of these kinds of hearings, and really saw the opportunities and legislation that created the opportunities for American industry to start working with the federal labs. So I am taking the initiative, knocking on the doors.

Mrs. MORELLA. If either Dr. Fisher or Dr. Law would like to comment at all?

Dr. FISHER. The only comment I would make is that in a program that we have underway right now, with the engineering re-

search center, we have been making use of the work that was carried out at National Standards Institute, in the Stuart Platform Development, which I think was supported by the DOD, and continues to be supported by that. We are trying to take that technology and with our own industrial partners apply the concepts there to construction.

I think the other one that I say would be applicable probably is the Title 3 steel program that I cited. I think there is an interest with the Department of Defense in moving that technology forward, because I think they see it is beneficial to their own interests as well, if there can be broader applications to the Title 3 steels to other than military applications.

Mrs. MORELLA. That's very good. I am glad to hear both of you at some point mention NIST, which is one of the major laboratories, and a major part of it is in the district I represent.

Dr. Law, would you like to have a stab at that?

Dr. LAW. With respect to your question about some of the technology associated with DOD's funding, I think you have said it—the Jeep and off-road vehicles are examples. I was conferring briefly with one of my colleagues here, and he confirms what my initial impression was with respect to the vehicles, that a lot of that technology perhaps would be transferrable to the heavy truck industry in the U.S., perhaps heavy construction equipment, off-road type things, I would guess, as compared to passenger vehicles.

Mrs. MORELLA. If there are issues we should pursue in terms of trying to promote it further, I hope you will all feel free to contact us.

Thank you, Mr. Chairman.

Mr. VALENTINE. Thank you, ma'am. I have just one or two things, to wrap up questions. I would like to explore briefly with the three of you gentlemen the business of whether or not there are adequate or almost adequate arrangements in the area of technology transfer—you know, we think of that as being applicable in these fancy, sophisticated new modern ever-changing ideas, and we are talking here, by and large, about something as ancient as the Roman Empire. The New Testament refers to the King's Highway.

Of course, I don't think they meant anything like an interstate. And there is the Appian Way. Now, I tried to get my distinguished assistant here to confirm the fact that that was a Roman road. He has failed to confirm that, and I have gone out into this area on my own.

So that's by and large what we are talking about, and the construction of great edifices as still exists in some parts of the world, and concrete is concrete, tar is tar, I suppose. But in this modern world, there must be efforts on the part of the Federal Government to construct airfields that are stronger than that stuff that was rolled out on the islands on the Pacific in World War II. There must be on the part of the Department of Defense an effort to develop a thicker, heavier concrete cover to protect rockets.

What effort is there being made now to exchange or pass on to roadbuilders things that are learned in connection with these military applications?

Dr. FISHER. I can't really answer that. I am not really knowledgeable about what efforts have been made, frankly, because I have

not worked in the area of concrete and pavement. That's not my area.

So I can't really respond to your question. I could ask and perhaps try to get back to you on that, but I cannot answer that today.

Mr. VALENTINE. Well, I would like to ask each of you to do that. I don't want to add to your burden unnecessarily, or ask a question that will require you to go and do a lot of expensive, time-consuming research, but you know, we talk and think about the construction of the new engines and the new drive system, and the outer cover, the outer body of a GM product. We think of those things as having resulted from the space program and in many cases military uses, and if you could direct our attention to some areas where the millions of dollars we have spent in military construction could possibly be utilized in a civilian area.

In answer to Mr. Walker, he kind of buzzed in and out, I tried to wait for him to get here to talk about speed as a safety problem, but we didn't have that opportunity. That would have been a good fight. Mr. Walker believes that speed does not kill. But he is not here, so I won't pursue that.

Someone asked about what the Government was capable of developing as opposed to private enterprise. Consider the F-18. Is that not a pretty good example of a contribution on the part of the Federal Government and American industry together? I can't put that "not" in the record.

Dr. LAW. As I interpret your question, sir, you are saying that Government and private industry working together have certainly come up with excellent products for our national defense. You say that the F-18, the Hornet, if I recall the name for it, the F-18 fighter plane, is an example. I would agree with you. Perhaps there are ways for that kind of interaction on the civilian front that would also result in superior products.

Mr. VALENTINE. I also heard referenced somewhere in the testimony here, which I think has been very good, and I want to compliment all three of you, I heard some reference to the fact that industry in this area does not get along too well with the Federal Government. That comes as no surprise, but I found that a shame, because they ought to have pretty good relationships. I don't know anybody who builds many big bridges and infrastructure except the Government.

We seek ways here to make your task easier in a sense, and to provide ways for the taxpayers to get more for their investment.

Thank you very much. The subcommittee stands adjourned.

[Whereupon, at 4:00 p.m., the subcommittee adjourned, to reconvene at the call of the Chair.]

APPENDICES

TESTIMONY

LARRY E. SALCI, PRESIDENT, BOMBARDIER CORPORATION

THE HOUSE COMMITTEE ON SCIENCE, SPACE AND & TECHNOLOGY COMMITTEE

JUNE 4, 1991

INTRODUCTION

Good afternoon, Mr. Chairman. My name is Larry E. Salci; I am President of Bombardier Corporation (U.S.). Bombardier Inc., our parent company, is a Canadian corporation headquartered in Montreal, Quebec, with an international focus. Bombardier is also a member of the Railway Progress Institute, the U.S. association of railway suppliers and manufacturers, and I am Chairman of RPI's Committee on Passenger Transportation which represents over 50 member companies in the railway supply industry.

Bombardier is engaged in designing, developing, manufacturing, and marketing transportation equipment, aerospace products, and motorized consumer products. We are North America's leading manufacturer of rail transit equipment with railcar manufacturing facilities in both Canada and the United States (Barre, Vermont). We also own railcar manufacturing companies in Belgium (BN), Austria (Rotax), France (ANF) and the United Kingdom (Prorail). Our French company, ANF Industrie, currently manufactures passenger coach rolling stock for the French TGV in conjuction with GEC Alsthom of France, the prime contractor for the TGV trainset. Bombardier also designed and manufactured the LRC tilt-body intercity train for Via Rail of Canada in the early 1980's. Bombardier's wholly-owned subsidiary, The Transportation Group, Inc. (Orlando, Florida), designs and markets monorail and people mover systems and was recently selected by Houston's Metropolitan Transit Authority to build a fixed guideway monorail system.

Bombardier has an exclusive agreement with GEC Alsthom of France for the marketing and manufacturing of TGV trainsets for North America. We have been leaders in the development of the high speed rail market in North America for the last decade, and specifically have been actively involved in projects in Florida, Texas and Canada. In fact, last week the Texas High-Speed Rail Authority voted unanimously to award a franchise to the Texas TGV consortium for which GEC Alsthom/Bombardier are the exclusive suppliers of the TGV trainsets.

In my presentation today, I would like to discuss the industry definition of high speed and very high speed rail technologies, the status of high speed surface transportation in the U.S., TGV technology, and the areas of technology improvements necessary to achieve higher speeds previously not believed possible.

DEFINITION OF HIGH SPEED AND VERY HIGH SPEED RAIL TECHNOLOGIES

For the purposes of this paper, I will define high speed rail, steel wheel on rail technology, as technologies of up to 150 mph. Technologies above 150 mph are defined as very high speed rail. I will come back to the very high speed threshold in a moment, but first let me describe several high speed rail technologies that are in existence around the world today.

Here in America, Amtrak currently operates high speed rail in the Northeast Corridor in the United States at speeds between 90 and 125 mph between Washington, D.C. and New York. The segment between New York and Boston has yet to be electrified; however, Congress appropriated $170 million in FY-91 to begin completion of electrification. It should be noted that in 1967 The Budd Company (passenger railway assets now owned by Bombardier) built the Metroliner (electrical multiple unit) which achieved speeds of 162 mph in test runs in the Northeast Corridor, utilizing Westinghouse electric propulsion; however, the track and infrastructure were insufficient for revenue operations at such speeds. It was during this time period that America stopped its high speed techology development; Europe and Japan continued.

In the United Kingdom, British Rail operates trains at approximately 125 mph. The Japanese National Railway has been operating the Shinkansen, or bullet train, for the past 20 years at speeds between 130 and 140 mph. In Germany, the Deutsches Bundesbahn operates its intercity high speed trains at 125 mph. In Italy, trains operate at approximately 140 mph. The Swedish Railway operates the X-2000 at approximately 125 mph.

As you can see, in general, most high speed trains that operate around the world today do so at speeds between 125 and 140 mph and are conventional electric motive power operations.

Now, let me turn to technologies that exist today that operate at speeds of 150 mph or higher which are considered to be very high speed steel wheel on rail technologies.

In 1972 the SNCF, the French National Railway, began development of the TGV. In 1981, the SNCF inaugurated the TGV on the Paris to Lyon southeast corridor with average speeds of 162 mph. In 1989, the SNCF inaugurated the second generation TGV technology on the Atlantique line which today operates at an average speed of 186 mph. (See Attachment 1, pp. 1-3.) It is apparent that the French have been operating very high speed rail service for over a decade. The TGV has carried over 50 million passengers on 80 million passenger miles without a single fatality, an unparalleled safety record. The SNCF is in the process of implementing a complete network throughout France that will be fully completed by the year 2000. In addition, the TGV also operates into Switzerland, Spain, and will shortly be in operation both in Belgium and the United Kingdom. Needless to say, there will be an extensive very high speed network throughout Western Europe which will provide the European Community with the finest surface transportation very high speed rail network in the world. This system will allow tremendous economies to be achieved in the transportation network of Western Europe. Later in my remarks I will describe in greater detail the technological achievements of the TGV.

On June 2, 1991 the Deutsches Bundesbahn inaugurated the Inter-City Express (ICE) which will operate in Germany at 155-174 mph and advertises it has 200 mph capability. Japan is also upgrading the Shinkansen (bullet train) for future service of 150-160 mph in the early 1990's.

Before I discuss the status of high speed rail activities in the United States, I would like to offer some brief comments about a technology that has been given a substantial amount of press attention of late.

If we are to believe a number of recent media reports, a new era is dawning in ground passenger transporation, an era in which wheelless and railless trains will literally fly between distant cities at 300 mph and offer a degree of comfort, safety, efficiency, and economy unmatched even by the most advanced railroad systems in operation today.

I refer, of course, to the much touted magnetically levitated, or maglev, transport technology, whose futuristic promise has captured the imagination of many--or at least of many federal officials and the newsprint media. Unfortunately, these visions of an idealized future transport system may be diverting attention and resources from less glamorous, but more realistic and practical, technologically advanced alternatives for development of very high speed surface transportation, notably in the United States. I believe the time is come to examine the claims for maglev and take an open minded, scientific and, above all, realistic approach.

The laws of physics dictate that at speeds above 150 mph, air drag is the most significant force to be overcome. For this reason, all high speed ground transportation passenger vehicles must be essentially similar in shape. Consequently, the energy consumption at a given speed is nearly identical for a maglev or traditional wheel/rail system, regardless of the specific technologies used to propel, guide or sustain the vehicles. Moreover, the economical operating speed for both systems is difficult to compare since TGV steel wheel technology has over ten years of experience and maglev remains in a research and development state.

The question that remains unanswered is: Would maglev really permit higher service speeds? The most important observation to be made here is that comparisons are being made between a proven technology--for example, the French TGV which operates daily at commercial service speeds of 186 mph--and speculative magnetic levitation systems with speeds "expected" to arrive at 300 mph. More important is the fact that TGV steel wheel on rail set the world surface speed record with a conventional train at 320 mph, which is 170% above today's top TGV operating speed. This record has substantially raised the threshold of upper speed limits for steel wheel on rail systems.

The German maglev reached, in fact, only 270 mph in 1989, while a commercial TGV trainset, with minor adaptations, exceeded 320 mph with more than 40 persons on board on May 18, 1990. During the TGV speed trials, significant mileages were logged: 1500 miles at speeds

of over 250 mph, and 600 miles at speeds of over 280 mph. This latter range is expected to be reached--but to date has not been--by maglev systems. We believe the ultimate speed limit for steel wheel/rail systems will be dependent upon energy cost. Assuming that such higher speed rail systems will be in fact economical, the feasibility of an ultra high speed (200 mph+) wheel/rail system is now effectively proved. Already 200 mph will be the commercial speed on the line under construction connecting Brussels and London to Paris, and speeds of 200 mph are planned for the new line that will link the southwest of Germany to Paris in the latter 1990's. Also, a 200 mph commercial speed is planned for the Texas project, scheduled to be implemented in 1998.

Many issues are still unresolved with the maglev system, such as traffic regulation, aerodynamic effects when two vehicles are passing, and operation during inclement, and particularly icy, winter conditions. I should also note that the possible strong effects of magnetic fields on the human body are not well known and still controversial.

As regards noise, maglev, somewhat surprisingly, is not significantly quieter than the last generation of very high speed trains. The explanation is that the major part of the noise generated during very high speed is due to air turbulence. The effects of noise are more noticeable and widespread with a maglev system since it usually operates on elevated tracks.

Also, there are specific advantages that favor the wheel/rail solution, especially the compatibility of such a system with existing rail networks which allows passengers to reach the centers of their destination cities conveniently or to travel to cities connected to the high speed infrastructure without having to transfer. This is presently a major advantage in Europe, and systems planned for U.S. applications need to be designed to interface with other modes of transportation.

HIGH SPEED SURFACE TRANSPORTATION IN THE U.S.

In the United States, there has been virtually no federal research and development funding for intercity rail transportation or maglev over the past decade. For eight years, the Reagan Administration repeatedly recommended zero funding for Amtrak, our national intercity passenger rail corporation. Fortunately, the Bush Administration recognizes the importance of America's having a balanced and flexible transportation system, and intends to help make Amtrak self-sufficient by the year 2000. However, federal policy is clear on new intercity systems; the private sector (and states) are responsible for the development of any high speed or very high speed intercity surface transportation system in the United States. Consequently, steel wheel on rail projects in California and Florida have not been able to make significant progress. The Texas very high speed rail project recently took a major step forward in the awarding of a franchise to the Texas TGV consortium; however, it will be approximately two years before the preliminary engineering and first equity tranche of financing is secured which will determine whether this project will move forward. It should be noted that the Federal

Railroad Administration has been extremely supportive of the industry's need for FRA to promulgate safety regulations for the operation of high speed and very high speed surface transportation systems.

Also, there are two maglev projects in this country which remain in the planning stages. The first, the intercity maglev project between Los Angeles and Las Vegas, recently was put on hold for nearly five years. The second, a 15-mile maglev demonstration project to link Orlando airport with the perimeter of Disneyworld, has yet to be finalized. The fact is there is no commercial maglev application anywhere in the world in operation today. There are a number of legal, commercial, and technological questions that need to be answered before a maglev system can be put into commercial revenue service. It is, therefore, sometimes hard to comprehend why the United States is focusing its entire, limited Department of Transportation funds for research and development for surface transportation technology on developing a U.S. maglev industry to leapfrog the German and Japanese technologies which to date have not yet been deployed or proven commercially viable.

Decision makers should be well aware of these realities of allocating nearly all U.S. research dollars on unproven technologies. I believe the realities are that maglev is a 2000 and beyond technology and that the economies of maglev are yet to be proven. Comparatively speaking, steel wheel on rail technologies offer not only solutions for today's transportation problems, but also offer the solutions for tomorrow's transportation problems with higher ranges or speeds clearly being achievable for steel wheel on rail. Steel wheel/rail technology should receive a fair share of research and development funds available.

DESCRIPTION OF TGV TECHNOLOGY

The second generation of TGV (Atlantique) is the world's fastest train. All its design innovations contribute to better operation of the French National Railway's lines and improved passenger comfort and safety. It is most important to note that the TGV is not simply a locomotive which hauls coaches, but it is a highly sophisticated, technologically advanced rail transport system. The genius of the French system is that it was designed to be compatible with the existing SNCF intercity railway system, and yet simultaneously be capable of operating at very high speeds in dedicated rights-of-way.

The TGV Atlantique trainset is configured with two power cars-- one at each end of the train--with ten articulated coaches in between the power cars. I will describe some of the main features of the TGV Atlantique, the result of nearly 10 years of development and proven service operation by the French government and industry.

POWER CARS (See Attachment 2.)

- Power car bodies have been redesigned and feature new contouring and improved aerodynamics over the earlier generation (1981) TGV.
- A new driver's cab layout is based on the findings of multidisciplinary ergonomic research and the structure is made of light alloy materials.
- Traction and auxiliary equipment alike have been designed using the latest developments in power electronics (freon cooled semiconductors, gate turnoff thyrister inverters, microprocessor control, multiplexing of controls between power cars, etc.).
- Synchronous motors for electric traction offer more power and lighter weight along with fewer maintenance operations for the motor because there is no commutator. This system was chosen over asynchronous motors for power traction because it is more difficult to use an asynchronous system for failsafe electric braking.
- The traction motors are suspended from the power car body rather than mounted on the truck frame in a conventional sense. This allows for reduction of unsprung mass and lighter weight which reduces the forces on wheel on rail wear.

TGV TRAILER CARS

The train is arranged in an articulated trainset with each truck (except for the end trailers) being common to the two adjacent trailer cars. The end trailer's truck, which is located at the power car end, is totally dedicated to that trailer car, whereas the other trucks are commonly shared with the adjacent trailer. In particular, this arrangement provides:

- less aerodynamic resistance (fewer trucks and smaller intercar gaps)
- reduced train weight due to reduced number of trucks
- improved ride quality
- improved truck layout (Large wheelbase provides stability at very high speeds.)
- low noise in the passenger seating area due to remote truck location
- lower wayside noise due to fewer number of axles
- ease of passenger movement within the trainset (more comfortable walking between cars) due to minimal transverse movement between the vehicles
- excellent reliability of trainlines
- better weatherproofing between cars, due to the absence of significant relative motion between cars.

AIR SPRUNG SUSPENSION SYSTEM (See Attachment 3.)

- o The SR-10 suspension system is an entirely new design which makes use of the possibilities of the articulation mechanism between two cars (specific to articulated TGV trainsets).

- o It eliminates truck to car dampers and carbody movement.

- o Lateral airbag flexibility varies with movement between the carbodies and trucks, and this accounts for excellent uncoupling of truck hunting and carbody movement at high speed together with very good behavior on the curves the train will negotiate at lower speeds on conventional lines.

- o Because speed increase is accompanied by significant rise in the amplitude and frequency of dynamic stress, this new suspension system will ensure a standard of riding comfort at 185 mph comparable to the ride quality of a modern passenger railcar at 100 mph.

CURRENT COLLECTION/PANTOGRAPH

- o A new pantograph was needed for operation at higher speeds; therefore, the main design principles of the new single arm pantograph are based on the same dynamics between the collector bow and the caternary wire, but improvements have been made in aerodynamics.

- o The pantograph is lighter. Both pantographs on each power car will be of this new type, and they will be able to operate on both the old SNCF lines as well as the new very high speed line.

BRAKING CONTROL SYSTEM (MOTORIZED AND NON-MOTORIZED TRUCKS)

- o The trainset is equipped with a high efficiency electropneumatic brake control system.

- o The brake equipment of each truck and its associated controls are completely independent.

- o The brake demands are transmitted through the trainset via a brake pipe complemented by an electropneumatic trainline for fast response of the braking equipment throughout the train.

- o New disc brakes have been combined with microprocessor based controls to prevent wheels from locking and sliding on the rails and to maintain continuous realtime control of adhesion at the point of wheel/rail contact.

- o Because of the need to eliminate brake shoe friction on wheels (to cut costs and reduce noise), this new brake disc was designed for much higher braking power which adds nearly seventy percent more capacity than that of the first generation TGV. Also the new disc brakes have the added advantage of functioning as heat sinks, and since they are not ventilated, they reduce train resistance to forward movement (3% lower drag coefficient).

- The friction brakes on the non-motorized trucks utilize cintered metal brake pads acting on disc brakes to supply the retarding force.

- On the motorized trucks (power cars), braking is provided by a dynamic brake system which is failsafe and operates even when no power supply is available from the caternary. The dynamic brake is blended with the operation of a friction tread break system. This system is designed to maximize use of the dynamic brake to minimize wear, and hence maintenance requirements, of the friction brake system.

- Operation of the system is monitored continuously by a microprocessor and redundancy is built into the system; a brake monitoring system checks the operation of the brake system before train departure and displays any malfunction on the operator's console.

AREAS OF TECHNOLOGY IMPROVEMENTS NECESSARY TO ACHIEVE HIGHER SPEEDS PREVIOUSLY BELIEVED NOT POSSIBLE

In summary, the TGV offers proven very high speed rail surface transportation technology, and the threshold of 200 mph plus is now theoretically possible. In fact, the infrastructure for the Texas very high speed rail project is being designed to accommodate trains at up to 250 mph. To achieve higher speeds, the key areas of technological improvements for very high speed rail systems are primarily:

- Wheel on rail contact and consequences on safety and quality of drive and comfort, emphasizing the need for high quality tracks.

- Design of very light structures enabling very low wear of wheels, tracks and ballast, and reducing braking energy.

- Improvement of aerodynamics of trains to save energy and reduce noise, both for stationary and unstationary (tunnels) situations.

- Improvement of safe and efficient braking systems. Regenerative braking is not considered failsafe; therefore, other dynamic or mechanical braking systems are to be considered.

- Current collection from caternary at very high speed.

- Safety of signalling and speed control systems.

- Noise reduction outside and inside trains.

- Safe and fault tolerant on-board or fixed communication data systems.

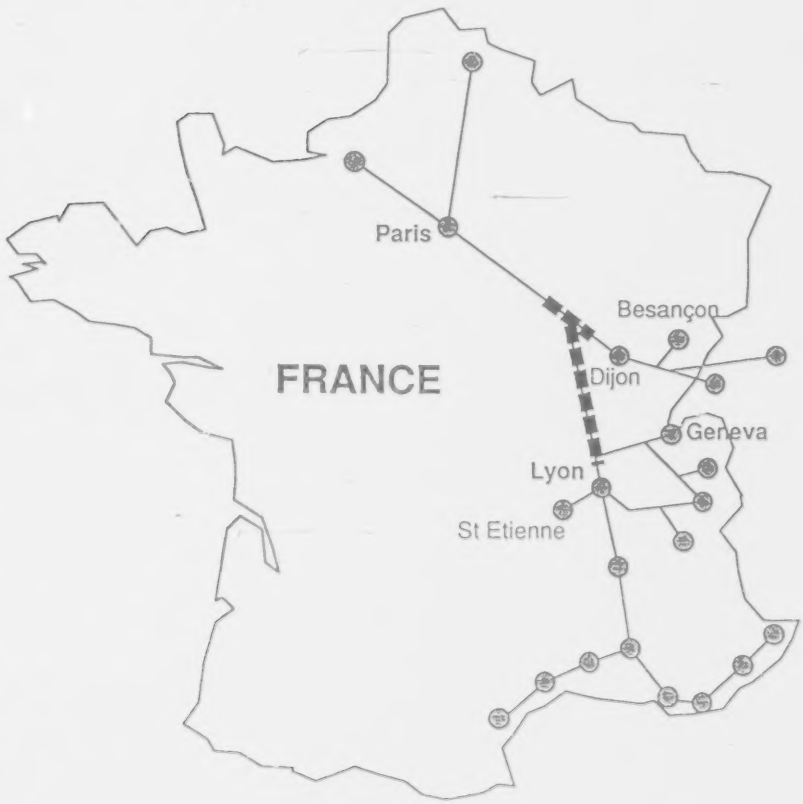
European industry and academic institutions are already working in all these areas. French research and development of very high speed rail programs could be linked with North American ones as already proposed at French Government level, leading to the creation of a dedicated "centre of excellence." Bombardier has recently taken the initiative to invite members of U.S. industry and academia to France for an explanation of the concept of the centre of excellence. The idea was met with great enthusiasm. America has the opportunity to participate, along with Canada, in the benefits of advanced very high speed rail technology transfer from France if it will provide leadership in fostering supportive federal policies that treat very high speed rail as an essential transportation mode as part of a flexible and balanced transportation system for the U.S. Decisions need to be made today to ensure that current and available technologies can be deployed in the U.S. during the 1990's.

GEC Alsthom/Bombardier stand ready to work with the Committee in providing any additional technical data or information on the TGV and its planned developments.

ATTACHMENT 1 - PAGE 1 OF 3

TGV Network in 1981

186 miles of new High Speed Line
(Total TGV network: 550 miles)



Annual TGV Traffic: 0.4 billion passenger-miles
or
1.4 % of total S.N.C.F. Intercity Traffic

ATTACHMENT 1 - PAGE 2 OF 3

TGV Network in 1990

436 miles of new High Speed Line
(Total TGV network: 2,730 miles)

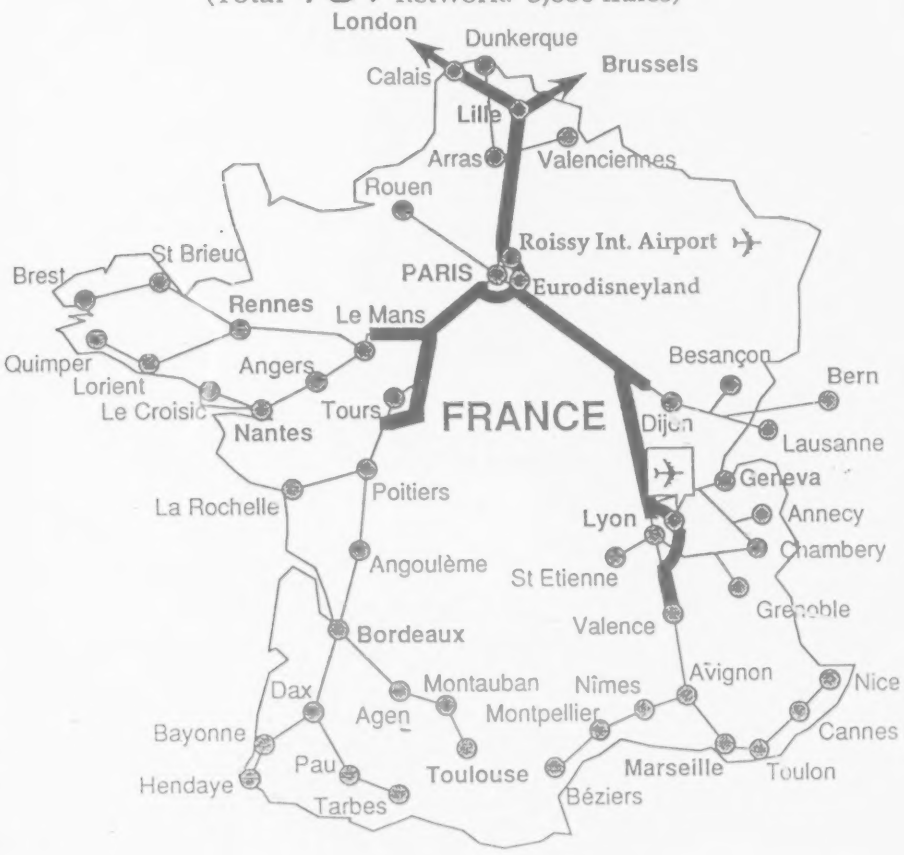
Annual TGV Traffic: 9.4 billion passenger-miles
or
30.5 % of total S.N.C.F. Intercity Traffic

ATTACHMENT 1 - PAGE 3 OF 3

TGV Network in 1994

783 miles of new High Speed Line

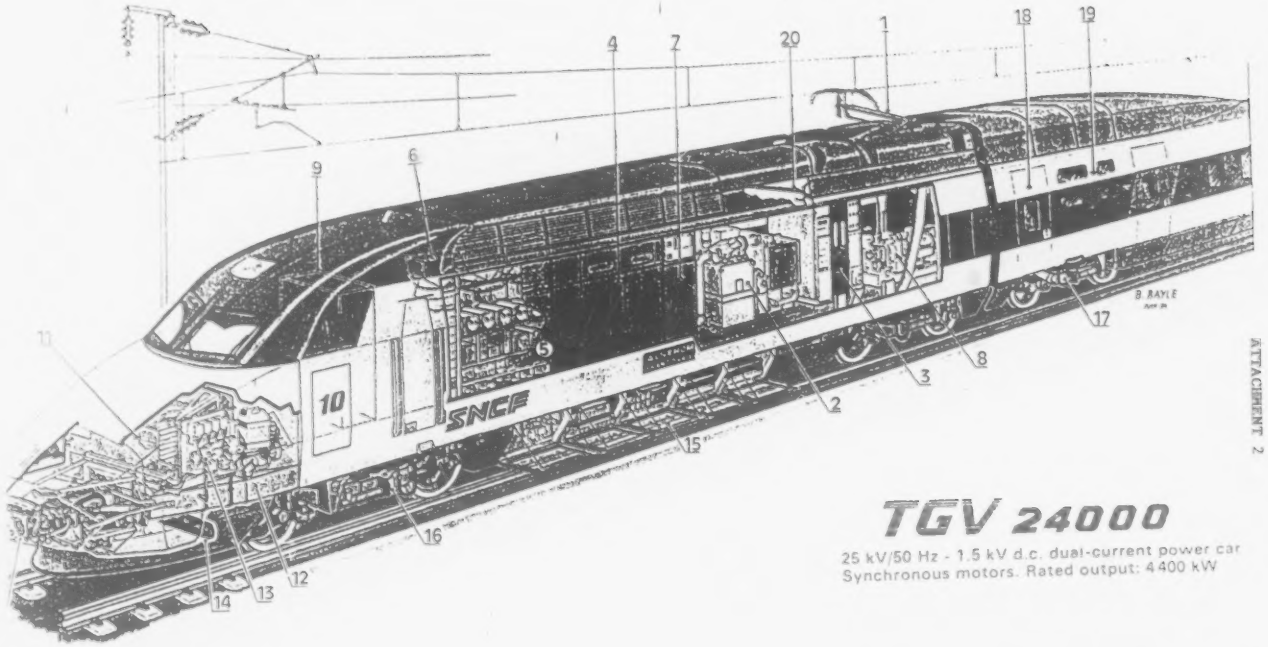
(Total TGV network: 3,680 miles)



Annual TGV Traffic: 18.6 billion passenger-miles

or

50.9 % of total S.N.C.F. Intercity Traffic



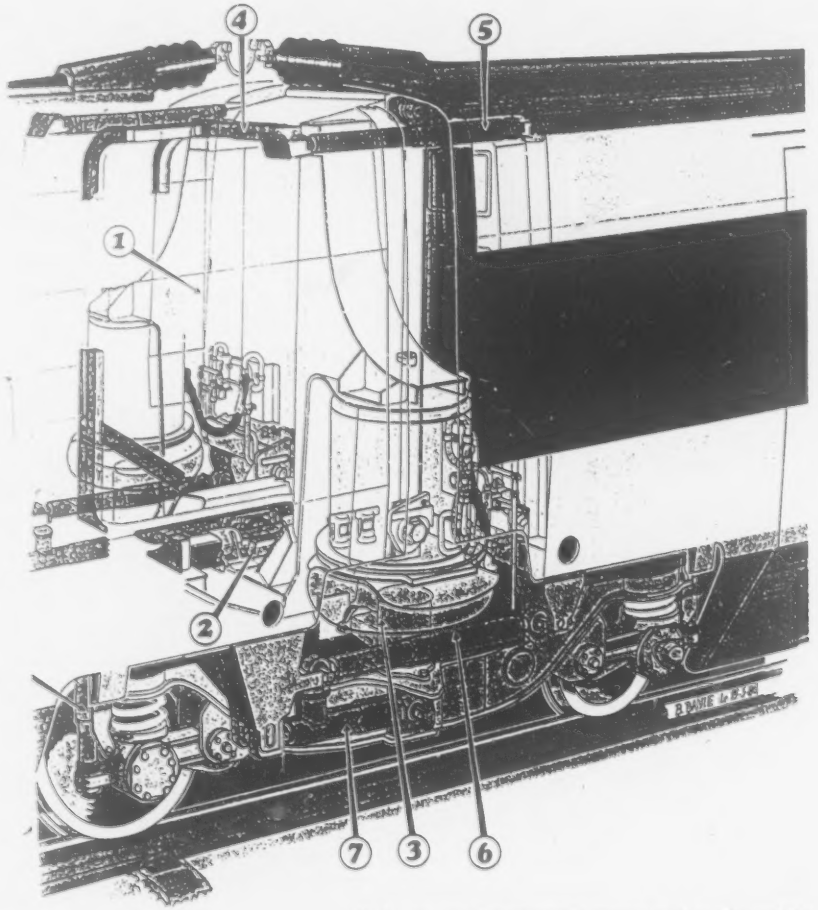
TGV 24000

25 kV/50 Hz - 1.5 kV d.c. dual-current power car
Synchronous motors. Rated output: 4 400 kW

1 - SINGLE ARM PANTOGRAPH
2 - MAIN TRANSFORMER
3 - CIRCUIT BREAKER, LINE FILTER
4 - MICROPROCESSOR-CONTROLLED TRACTION MOTOR
5 - FREON COOLING FOR SEMICONDUCTORS
6 - BRAKING RHEOSTAT
7 - AUXILIARY POWER SUPPLY
8 - MAIN COMPRESSOR
9 - COMPUTER AND SAFETY EQUIPMENT
10 - AUTOMATIC COUPLER
11 - IMPACT SHIELD
12 - BODYFRAME MADE OF HIGH YIELD POINT STEEL
13 - BRAKING CONTROLS
14 - TRACK CIRCUIT CODE SENSORS
15 - EQUIPMENT HOUSING
16 - TYPE Y230 POWER TRUCK
17 - TYPE Y237 B TRAILING TRUCK
18 - BAGGAGE COMPARTMENT
19 - PASSENGER SEATING
20 - LIGHT ALLOY ROOF PANELS

SNCF DIRECTION DU MATERIEL

Fig. 6. — 4 400 kW for 67.8 t: an exploit made possible with synchronous traction motors and through new advances in component technology.



SR 10 AIR-SPRUNG SUSPENSION SYSTEM

1 - CARRIER RING
2 - BALL AND SOCKET JOINT
3 - HIGHLY FLEXIBLE AIR BAGS
4 - ANTI-ROLL DAMPER
5 - UPPER INTER-CAR LONGITUDINAL DAMPER
6 - LOWER INTER-CAR LONGITUDINAL DAMPER
7 - ANTI-HUNTING DAMPER
8 - ANTI-PITCH DAMPER

ATTACHMENT 3

Fig. 9. — The novel air-sprung suspension system makes full use of the possibilities of the articulated trainset to provide the same ride quality at 300 km/h (186 mph) as in the best passenger cars operated at 160 km/h (100 mph).

SNCF DIRECTION DU MATÉRIEL Sept. 1986

CONGRESSIONAL STAFF SYMPOSIUM ON
HIGH SPEED GROUND TRANSPORTATION ISSUES

June 10, 1991

R. K. Pattison - Chairman High Speed Rail Association
Technical Director - Railroads - Parsons Brinckerhoff

Thank you for convening this symposium on High Speed Ground Transportation. This indicates to me the rapidly increasing interest in high speed rail in Congress. I testified probably two years ago before Senator Moynihan and before Senator Exon on magnetic levitation and steel wheel high speed rail. The interest in HSR was just starting and today look at the great media interest in the Texas project (national news). All HSR projects will need changes in federal law to permit issuance of tax exempt bonds. There must be a significant federal role to encourage development of high speed rail. This role is mandated by both the National Transportation Policy and the National Energy Strategy.

The High Speed Rail Association map shows the projects under study.

The National Transportation Policy lists six objectives that includes words like "encourage", "foster", provide seed money", etc., but does not contemplate direct federal investment. The federal role is that of a "catalyst". The word "catalyst" must be read broadly to include right-of-way access, lifting of the tax exempt cap, guaranteed loans, federal payment for grade crossing elimination and state flexibility for highway trust fund use.

The National Energy Strategy includes five objectives on how we expect to produce and use energy in the future. Two of these: enhancing energy and economic efficiency and enhancing environmental quality can add greatly to the strategy of the National Energy Policy.

High speed trains can make a major contribution to energy conservation. The energy efficiency of electrically powered trains is unmatched, significantly more than automobiles and jetliners for several reasons: electric motors are more

efficient than internal combustion engines. The airplane and the automobile carry their own fuel, thus extra weight, while the electric-powered train is dedicated 100 percent to moving the passengers, virtually no energy is expanded for "idling".

Air Pollution - The current transportation modes are major generators of noxious pollutants into the air we breathe.
Despite widespread concern of our air quality, it continues to decline. High speed trains can provide fast travel without polluting the countryside and our most densely populated cities. Expect more environmentalists to argue for high speed, electrically-powered trains as a cleaner alternative.

There is another area that should be considered and that is Transportation Safety. Environmentalist Andrew Kimbrell wrote, "In the U.S. the automobile had cost its first million dead by 1952, its second million by 1975, and the third million is likely by 1994. In all, the more than 2.5 million Americans who have died violent deaths on our highways represents more than four times the 641,691 Americans killed in World War I, World War II, Korea and Vietnam combined." There's a big financial cost to this: $70.2 billion in 1988 alone. Consider the alternative. Japan has been running the bullet trains for 27 years. France has operated the high speed TGV for about nine years. This represents more than three billion passengers carried in speed and comfort but not one passenger has been killed on those trains.

The Federal Railroad Administrator, Gilbert Carmichael, often describes high speed trains as an "ethical transportation system" It's easy to see why.

Since the August invasion of Kuwait by Iraq, and with recession-related worries plaguing the nation, business has been cautious. Wariness has given way to enthusiasm when it comes to high speed trains. Industry is mobilizing on this issue. The High Speed Rail association is growing at a phenomenal rate of 20 percent this year.

It is fair to say that high speed train concepts are being supported today by a broad range of interests - aerospace companies; railway suppliers; turnpike authorities; universities; construction firms; U.S. maglev scientists and foreign

maglev manufacturers; engineering law firms; labor unions; transit operators; tourist boards; overseas and domestic railroads; and the investment community.

The nation should, in conjunction with industry, support research on high speed ground transportation. A domestic maglev program is vital to our long-term technological prowess. The United States should refuse to surrender to foreign competitors what will someday become a major world market for maglev trains.

Amtrak has come a long way in improving its service, but it remains capital starved. Many corridors in the nation, not yet quite ripe for an all-new high speed line, deserve the benefits that come from upgrading Amtrak. The federal government must help upgrade Amtrak routes that cross many state borders and constitute true interstate commerce. The Boston-New York corridor is a prime example.

In conclusion, it is clear that the nation is ready for construction of working high speed train systems as well as for developing a U.S. maglev technology. There is a Federal Aviation Plan and a Highway plan - we need a High Speed Ground Transportation Plan. It is time for Washington to take more leadership toward the momentum built up at the state level. I hope that this conference will contribute toward an acceleration of efforts to pass constructive high speed rail legislation in this session of Congress.

Thank you.

NATIONAL TRANSPORTATION POLICY
Strategies for Action

1. MAINTAIN AND EXPAND THE NATIONS' TRANSPORTATION SYSTEM.

2. FOSTER A SOUND FINANCIAL BASE FOR TRANSPORTATION.

3. KEEP THE TRANSPORTATION INDUSTRY STRONG AND COMPETITIVE.

4. ENSURE THAT THE TRANSPORTATION SYSTEM SUPPORTS PUBLIC SAFETY AND NATIONAL SECURITY.

5. PROTECT THE ENVIRONMENT AND THE QUALITY OF LIFE.

6. ADVANCE U.S. TRANSPORTATION TECHNOLOGY AND EXPERTISE FOR THE 21st CENTURY.

NATIONAL ENERGY STRATEGY

1. ACHIEVING GREATER ENERGY SECURITY
2. INCREASING ENERGY AND ECONOMIC EFFICIENCY
3. SECURING FUTURE ENERGY SUPPLIES
4. ENHANCING ENVIRONMENTAL QUALITY
5. FORTIFYING FOUNDATIONS

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WHEN CAN WE START BUILDING ?

Parsons Brinckerhoff 100 YEARS

High Speed Trains Are Coming To North America

Vancouver, B.C.
Seattle
Tacoma
Spokane
Moses Lake Airport
Portland
NORTHWEST
SEATTLE-MOSES LAKE
Study underway of feasibility of new international airport at Moses Lake (a former military field), connected with Sea-Tac Airport by Maglev, ever-tually to be e-tended to Spokane.
Renewed interest in High Speed Rail system to unite Vancouver, Seattle and Portland
PACIFIC SOUTHWEST
CALIFORNIA-NEVADA SUPER SPEED
Caltrain-Nevada Super Speed Train Commission has surveyed for HST commerce between San Diego-Los Angeles-San Francisco-Sacramento-Reno-Las Vegas-Phoenix-Orange County-Santa commission, starting with Las Vegas-Southern California route. Second commission studied Los Angeles-Sacramento-San Francisco route
Sacramento
San Francisco
Reno
San Joaquin Valley
Las Vegas
Antelope Valley
Los Angeles
Orange County
Inland Empire
San Diego
Phoenix
New Airport
Tucson
ARIZONA
PHOENIX-TUCSON
Arizona DOT official has requested federal funding for study of a new airport railway between Tucson and Phoenix to be connected by high-speed trains
COLORADO
PUEBLO-COLORADO SPRINGS-DENVER-BOULDER-FT. COLLINS
Legislative effort undertaken in 1991 to create High Speed Rail Commission
Boulder
Ft. Collins
Denver
Colorado Springs
Pueblo
Santa Fe
Albuquerque Airport
NEW MEXICO
SANTA FE-ALBUQUERQUE
Acting on a recommendation to concentrate on the Santa Fe-Albuquerque corridor New Mexico Transportation Department completed a feasibility study
TEXAS
DALLAS-HOUSTON-SAN ANTONIO-AUSTIN-DALLAS
High Speed Rail Authority organized. Contenders include German Consortium (DE Train) and Morrison-Knudsen (TGV Technology)
Tulsa
Oklahoma City
DFW Airport
Ft. Worth
Dallas
Waco
Austin
San Antonio
Houston
New Orleans
ROCKFORD-O'HARE AIRPORT
Study underway
MINNEAPOLIS-CHICAGO
Study under way by Minnesota, Illinois & Wisconsin for HST between Minneapolis, Milwaukee and Chicago.
Minneapolis/ St. Paul
La Crosse
Madison
Milwaukee
Rockford
Chicago
DETROIT-CHICAGO-ST. LOUIS-KANSAS CITY-INDIANAPOLIS-CINCINNATI
Maglev system recommended by Argonne National Laboratory study. Michigan DOT leading a program to provide Detroit-Chicago upgraded system.
Battle Creek
Detroit
Toledo
Springfield
Indianapolis
Cincinnati
Kansas City
St. Louis
Louisville
OHIO
CLEVELAND-COLUMBUS-CINCINNATI
Consortium submits proposal to build and operate Cleveland-Columbus-Cincinnati HST.
Windsor
Erie
Cleveland
Pittsburgh
Columbus
Harrisburg
Washington DC
Richmond
Norfolk
Greensboro
Raleigh
Charlotte
Chattanooga
Atlanta
Columbia
Birmingham
New Airport
Macon
Columbus
Savannah
Jacksonville
Tallahassee
Port Canaveral
Airport Orlando
Tampa
Fort Myers
Palm Beach Airport
Ft. Lauderdale
Miami
GEORGIA
ATLANTA-COLUMBUS-MACON-SAVANNAH
Georgia DOT Commissioner proposes building a new international airport at site convenient to Atlanta, Macon, and Columbus, with high-speed trains linking the airport with those cities as well as with Savannah. Argonne study as well as mayors call for Atlanta-Savannah line independent of airport proposal
FLORIDA
MIAMI-ORLANDO-TAMPA
Review process by Florida High Speed Rail Commission narrows field to one applicant, Florida High Speed Rail Corporation. Additionally plan proceeding to install Transrapid Maglev between Orlando Airport and a transportation complex near Disney World. Possible later extensions to Jacksonville, Tallahassee and Fort Myers.
Quebec
Montreal
Ottawa
Kingston
Toronto
Buffalo
Albany
Burlington
Portland
Boston
QUEBEC CITY-WINDSOR
TORONTO-MONTREAL
High speed train task force examining possibilities. Proposals being made by Bombardier (TGV) and AGEA Grown Bowen (Fass Train). Joint commission established by provinces of Ontario and Quebec.
EMPIRE CORRIDOR
NEW YORK CITY-ALBANY-BUFFALO
New York DOT, Grumman Corp and GE doing study of High Speed Rail to New York City-Albany-Buffalo.
EMPIRE CORRIDOR
NEW YORK CITY-MONTREAL
Study showed revenues sufficient to cover operating costs but not sufficient to amortize investment estimated at $2.3-bn (an, potential thought good enough to warrant further study
New York City
Philadelphia
NORTHEAST CORRIDOR
Coalition of Northeast Governors (CONEG) promoting HSR service between Boston and New York. Several groups examining New York-Washington, D.C. route
PENNSYLVANIA
PITTSBURGH-HARRISBURG-PHILADELPHIA
Pittsburgh's Carnegie Mellon University proposed a maglev demonstration line from the city's downtown to its airport, eventually to be developed into a regional network. Dr. Magliev Inc. Also, final report of the Pennsylvania High Speed Rail Commission recommended maglev as the technology of choice for a cross-state high-speed system.

HIGH SPEED RAIL ASSOCIATION

206 Valley Court, Suite 800, Pittsburgh, PA 15237

March 1, 1991

[Submitted by Mr. Marvin Stockman in response to Chairman Valentine's invitation for comments from the general public on matters related to this hearing.]

PAUL S. SARBANES
MARYLAND

COMMITTEES:
BANKING, HOUSING AND URBAN AFFAIRS
FOREIGN RELATIONS
JOINT ECONOMIC

United States Senate
WASHINGTON, D.C. 20510-2002

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SH-309 HART SENATE OFFICE BUILDING
WASHINGTON, D. C. 20510
202-224-4654

1518 FEDERAL OFFICE BUILDING
BALTIMORE, MARYLAND 21201
301-962-4436

1110 BONIFANT STREET, SUITE 460
SILVER SPRING, MD 20910
301-589-0797

CUMBERLAND: 301-724-0695

SALISBURY: 301-860-2131

May 30, 1991

Mr. Marvin Stockman
14720 Maine Cove Terrace
North Potomac, Maryland 20878

Dear Mr. Stockman:

Following up on our previous correspondence regarding seat belt safety, I am enclosing a copy of a letter which I recently received from the United States Department of Transportation in response to your comments. I hope that the information provided will be helpful in answering your questions about this matter.

Please do not hesitate to let me know if there is any way in which I might be of further assistance.

With best regards,

Sincerely,

Paul Sarbanes

Paul S. Sarbanes
United States Senator

PSS/cbc
Enclosure

U.S. Department of Transportation
National Highway Traffic Safety Administration

The Administrator

400 Seventh St., S.W.
Washington, D.C. 20590

91 MAY 17 PM 12:01

MAY 14 1991

The Honorable Paul S. Sarbanes
United States Senate
Washington D.C. 20510

Dear Senator Sarbanes:

Thank you for your letter enclosing correspondence from Mr. Marvin Stockman who raises issues regarding "window shade" devices on safety belts. I appreciate the opportunity to discuss this with you.

The National Highway Traffic Safety Administration (NHTSA) is responsible for administering a wide variety of programs and activities directed at improving motor vehicle safety. One of our principal functions is the issuance of Federal motor vehicle safety standards. These safety standards require minimum levels of safety performance for new motor vehicles and items of motor vehicle equipment. Our standards fall in two basic categories: standards to reduce the risk of becoming involved in a crash (e.g., minimum performance levels for brakes, lights, tires, etc.), and standards to reduce the risk of injury, should a crash occur (e.g., minimum performance levels for safety belt systems, automatic frontal crash protection, fuel system integrity, etc.). One of our safety standards is concerned with occupant protection in a frontal crash and the comfort and convenience of safety belts.

The window shade devices (also known as tension-relieving devices) that your constituent, Mr. Stockman, refers to in his letter, were first permitted and used in safety belt systems to encourage safety belt use. Throughout the 1970's and mid-1980's, front seat safety belt usage remained between 10-15 percent. Some of the most frequent reasons for <u>not</u> wearing belts were that the belt did not fit properly (e.g., came across the neck) or exerted too much pressure on the chest. Vehicle manufacturers attempted to counter these consumer complaints by introducing tension-relieving devices. (Please note that this agency neither required, nor encouraged, these devices.) If properly used, a small amount of slack will improve the comfort for certain

Get it together!
SAFETY BELTS SAVE LIVES

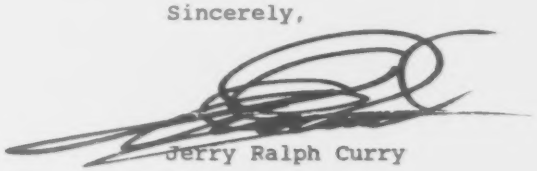
individuals and will not reduce the effectiveness of a safety belt. Tension-relieving devices were discontinued by Ford and Chrysler several years ago, and will be phased out of all models of General Motors automobiles by the end of this model year. When vehicles were produced with tension-relieving devices, these devices were not routinely misused. Our on-going survey of safety belt use indicated that safety belt misuse was as common in foreign cars without these devices as in cars that had the tension-relieving devices. Also, there is no evidence to indicate that the small amount of slack that was normally seen in vehicles would reduce the effectiveness of these belts.

Clearly, though, if consumers abuse the system by introducing excessive amounts of slack, occupant protection will be degraded. To prevent this, auto manufacturers are required, by Federal regulation, to indicate the maximum amount of slack that can safely be used. Also, according to Federal rules, this agency will test the safety of the vehicle with that amount of slack introduced into the belt system.

You should be aware that this agency along with domestic and foreign manufacturers strongly supports the development and installation of devices that are aimed at increasing the comfort and usage of safety belts. Manufacturers are planning to introduce adjustable upper anchorages, new belt geometry and routing designs, new types of retractors, and other devices to reach this goal.

I hope this information is useful to Mr. Stockman.

Sincerely,



Jerry Ralph Curry

[Submitted by Mr. Marvin Stockman in response to Chairman Valentine's invitation for comments from the general public on matters related to this hearing.]

SUBCOMMITTEE ON TECHNOLOGY & COMPETITIVENESS,
U.S. HOUSE OF REPRESENTATIVES,
B-374 RAYBURN BUILDING,
Washington, DC, June, 1991.

ATTN: R.E. Williams

DEAR SIR: This letter is in response to my concern about the effectiveness of tension-relieving (window shade) seat belts in accident situations. I am writing to inform you that I am aware of a method to defeat the "window shade" device on American cars. I purchased a 1987 Ford Taurus in March 1987, and have been concerned with the amount of slack that is built up in the belts. A few months ago I investigated the mechanism and decided what had to be done. It disabled the "window shade" without affecting the proper functioning of the belt. I have since disabled the "window shade" on my 1981 Chevy Caprice, a friend's 1987 Plymouth van and another friend's 1988 Dodge van.

Concurrent with the above work I contacted a Mr. Robert Dewey of the Center for Auto Safety, to see if others had come up with the same or other methods for disabling the "window shade". He informed me that Mr. Patrick Bedard in the June 1987 issue of Car and Driver magazine had written on the subject and that my method appeared to be about the same as his. I am enclosing, for your information, a copy of his article. My method appears to be somewhat simpler than Mr. Bedard's. The Plymouth and Dodge vans took about thirty seconds to defeat the "window shade". The Chevy and the Ford took about three minutes each.

I would be more than happy to show your Subcommittee how to make their front seat belts safe. Please contact me as soon as you can as I would like to get this information to as many people as possible in the shortest time possible.

Yours truly,

MARVIN STOCKMAN

CAR AND DRIVER, JUNE 1987

PATRICK BEDARD

Slack thinking in Detroit.

• Further down the page I'm going to say bad things about some people, and in fairness to them I probably should admit that my views on today's topic tend toward the extreme.

Now, in fairness to me, I also want to say that this extremism is the only reason I'm alive today.

We're going to talk about seatbelts and how they should fit. Before my last Indy 500, as the car was being rebuilt for the race, I asked that the lap belt be shortened half an inch. The shoulder straps of an Indy car are readily adjustable—which also means that they loosen themselves, so I was in the habit of tugging them tight every few laps—but the lap-belt length is fixed. Changing it is a fifteen-minute wrench job.

The driver harness in an Indy car is a six-point system: a strap over each shoulder, a strap over each hip, and a pair running down between the legs. This last set pulls downward on the lap belt to keep you from sliding under the harness. I suppose the Indy-car system could be called "passive belts," because the driver doesn't fasten it himself. He can't: the cockpit is too narrow. Imagine trying to buckle the belt that holds up your pants if you had no elbowroom. Somebody would have to do the job for you, and that's what happens in an Indy car.

On race morning, when "Gentlemen, start your engines" had already been said and pre-race tension was nearing its peak, I once again went through my part of the belt-fastening ritual, which amounted to pushing myself back in the seat to get as skinny as possible. And the mechanic leaning in over the side did his part: he struggled with the belts. But this time he couldn't make the ends meet. We had forgotten to do a trial fitting. The engines were running, and the start was near. The mechanic was working himself into a frenzy. Then I felt him despair, give up. The Indianapolis 500 was about to start, but his car would have to be pushed to the sidelines because, of all pathetic reasons, the seatbelts were too tight to fasten.

At what seemed the last second, another mechanic leaned into the car from the other side, and, together, they produced the click. The fit was snug; just about right, I thought.

I don't remember leaving the track that day. In fact, I don't remember much of anything that happened during the following week. About a month later I saw a replay of my exit from the race. The car had been reduced to a monocoque capsule, and it was bounding down the track, crashing to earth, then recoiling high into the air again. It continued in this fashion until all of its energy had been spent, and I thought the human inside should have been hammered to a pulp.

Only one thing could have kept him whole. He must have been perfectly restrained.

A short time later a man introduced himself as someone I wouldn't remember. He was one of the medics who had removed me from the wreckage. I asked him if the belts had stayed tight. "Yes," he said, "they did."

Let me tell you how belts work. When a car crashes, it stops quickly, within whatever distance it crushes (in a simple barrier crash). An unbelted occupant, however, does not stop so quickly. He keeps on going until he splats against something inside the car. Injuries result, maybe death.

A belted occupant keeps going, too, because nothing is rigid: the seat gives, the belts stretch, the rib cage deforms. And if the accident is severe, he will move so far that he will likely hit something. It's common for the driver's head to bash the steering wheel or the windshield. But because of the belts, the hit will be less violent. That's the payoff.

Accident survival is complicated, because impact angles are different and people come in a zillion sizes. For frontal accidents, you probably should drive Stirling Moss style: arms straight, sitting well back from the wheel. But maybe you'll hit something else then. There are so many variables that nobody can say what's best.

There is only one detail you can bank on. You don't want slack in your belts.

Slack is bad for two reasons. First, your body will gain momentum before it reaches the end of its free travel, and the impact of your body against the belts can cause injury. Second, slack means that the belts, once you're against them, have less room in which to restrain you before you hit something. All of this assumes the slack is minor enough so the belts are still properly positioned. Too much slack and you can fly right out of them.

In my opinion, there is no excuse for slack in seatbelts. This is just common sense. In passenger cars, the likelihood of accidents is so much lower than it is in racing cars that the motoring public wouldn't tolerate six-point harnesses. Neither would I. The motoring public wouldn't tolerate belts that fit like tourniquets, either. Neither would I. But slack in the belts we have now is unforgivable. I know it could kill me.

The world's auto industry divides into two sides on this point. All the makers outside the U.S. (that I know of) are against slack, so their belt systems have a small but constant tension to hold them in position across the chest. Almost all made-in-Detroit belts have the "window shade" feature, which responds to certain movements away from your original position by stopping the retractor there, leaving slack when you return. The result, in my experience with Detroit cars, is excessive slack: move enough to tune the radio and the belt droops when you sit back.

David Martin is director of auto-safety engineering at General Motors. I gave him a chance to defend the Detroit system. He said: "The name of the game in the restraint business is to get people to wear what's in the cars. We have been afraid we wouldn't have very many of our customers wearing the belts unless we had some way of taking the tension off. There is a very substantial number who object. And we are responding to them—at an added cost, I might say."

A spokesman for the National Highway Traffic Safety Administration declined to talk on the record but indicated that the government is in philosophic agreement with the industry.

Martin also pointed out—and the NHTSA confirmed—that all crash tests are performed with the slack set according to the owner's manual.

A typical GM manual says, "Keep any shoulder-belt slack to a minimum—no more than 25mm (one inch)." And it describes the procedure for arriving at the proper slack.

I'll tell you why Detroit's seatbelt system is junk, and why everyone responsible for it—including those in the NHTSA—should be tried for reckless endangerment: because that retractor is absolutely determined that you will drive with slack in your belts, even if you know better. It has been designed to sabotage your every

effort to maintain tension.

When you first fasten the belt, tension is present, and it stays until you move in the seat. Then you've got slack. And if you don't get slack on the first move, you will on the second, or the third, or sometime very soon. To obtain tension again you have to pull the shoulder belt out at least five inches, then release it. Now you're back to square one, waiting for the sneaky slack to reappear.

The only way to avoid this endless fight with the retractor is to go through the adjustment procedure detailed in the manual. It says, "Pull down on the shoulder belt the least amount needed to ease pressure but no more than 25mm (one inch) and let go." That's supposed to set the retractor like a window shade, holding the belt so you get a "safe" amount of slack.

I recently obtained a Pontiac Grand Am specifically to test the belt system. A pull on the belt as short as a quarter of an inch would occasionally set the retractor. Fine. I wouldn't complain about a quarter-inch of slack. But these were lucky occurrences. I also did several ten-in-a-row trials in which I could not get the retractor to give me less than 1.5 inches of slack. Clearly, getting safety out of these safety belts is a whole lot more complicated than merely buckling up.

This system is philosophically and morally bankrupt. It allows the marginal occupant—the willy-nilly who won't belt up if it's the slightest nuisance—to determine the level of safety available to everybody else. Why should the interests of this ninny, who doesn't give a hoot about his own well-being, be valued more highly than mine? The United States is becoming a country preoccupied with the longevity of ninnies. We despoil individual liberties with mandatory-belt laws to save ninnies. We fritter away resources with passive-restraint requirements to save ninnies.

Devil take those who won't act to save themselves, I say. It is perfectly reasonable to expect motorists to make a small commitment to their own safety. Fastening their seatbelts is that commitment. Once they hear the click, they have the right to expect state-of-the-art protection.

What is *not* reasonable is expecting people to *recommit* to safety every time they make a move in the seat that causes the belt to go slack. What is *not* reasonable is expecting people to outguess a retractor that's completely random in its operation. The foreigners can make systems that work to my complete satisfaction. Why can't the Americans?

Maybe it's time to take matters into our own hands. If you feel as strongly about no-slack belts as I do, you might like to disable the window-shade feature in any American cars you drive. I asked an official spokeswoman at General Motors if the slack-producing part of the GM retractor could be defeated without hurting its proper function in the event of an accident. The answer was "Yes." I asked if the corporation would tell me how to do it for the benefit of *C/D* readers who might like to perform that operation. The answer was "No."

Why not? "Because then future owners of that car would be deprived of the comfort feature," she said, using the PR term for the slack producer.

Does anything else need to be said about GM's priorities?

I'll tell you what I've learned on my own. Since the window-shade feature is defeated in many cars when you open the door, it seems logical to trick the system into thinking the door is always open. On many recent General Motors cars there is a black button on the doorframe that is connected to the retractor by a shielded cable. Disconnecting this cable, in every case I've tried, produces a belt that works just like the foreigners: constant tension in normal circumstances, inertial locking at modest g levels. The comfort of future occupants may be diminished, but my own is enhanced enormously.

To protect myself and this magazine from the litigators, I must warn you that this is unproven surgery. There is a risk that the belts might not operate properly, and I can't be responsible. *So don't cut the cable.* I think your car will be safer if you do, but *don't do it!*

MARKUP OF H.R. 2941, TO AUTHORIZE APPROPRIATIONS TO THE DEPARTMENT OF TRANSPORTATION FOR SURFACE TRANSPORTATION RESEARCH AND DEVELOPMENT, AND FOR OTHER PURPOSES

THURSDAY, JULY 18, 1991

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
SUBCOMMITTEE ON TECHNOLOGY AND COMPETITIVENESS,
Washington, DC.

The subcommittee met, pursuant to notice, at 1:08 p.m. in room 2325, Rayburn House Office Building, Hon. Tim Valentine (chairman of the subcommittee) presiding.

[H.R. 2941 plus summary of bill follows:]

(Original signature of Member)

102nd CONGRESS
1st SESSION

H.R. 2941

To authorize appropriations to the Department of Transportation for surface transportation research and development, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

July 18, 1991

MR. VALENTINE (for himself, Mr. Lewis of Florida, Mr...(original sponsor list will be dropped in hopper before COB)...introduced the following bill; which was referred to the Committee on

A BILL

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the ``Surface Transportation Research and Development Act of 1991''.

SEC. 2. FINDINGS.

The Congress finds that--

(1) despite an annual expenditure in excess of $10,000,000,000 on surface transportation and its infrastructure, the Federal Government has not developed a clear vision of--

(A) how the surface transportation systems of the 21st century will differ from the present;

(B) how they will interface with each other and with other forms of transportation;

(C) how such systems will adjust to changing American population patterns and lifestyles; and

(D) the role of federally funded research and development in ensuring that appropriate transportation systems are developed and implemented;

(2) the population of the United States is projected to increase by over 30,000,000 people within the next 20 years, mostly in existing major metropolitan areas, which will result in increased traffic congestion within and between urban areas, more accidents, loss of productive time, and increased cost of transportation unless new

VALENT023

3

technologies are developed to improve public transportation within cities, to move people and goods between cities, to connect air and sea transportation with final destinations, and to decrease repair costs for rail and highway infrastructures;

(3) 18,000,000 crashes, 4,000,000 injuries, and 45,000 fatalities each year on the Nation's highways are intolerable, and substantial research is required in order to develop safer technologies in their most useful and economic forms;

(4) current research and development funding for surface transportation is insufficient to provide the United States with the technologies essential to providing its own advanced transportation systems in the future, and as a result the United States is becoming increasingly dependent on foreign surface transportation technologies and equipment to meet its expanding surface transportation needs;

(5) a more active, focused surface transportation research and development program involving cooperation among the Federal Government, United States based industry, and United States universities should be organized on a priority basis;

(6) the automobile will remain the principal mode of surface transportation in the United States into the

VALENT023

4

foreseeable future, but will need new materials, equipment, and systems in order to be safer and to take advantage of intelligent vehicle highway systems (IVHS);

(7) intelligent vehicle highway systems represent the best near-term technology for improving surface transportation for public benefit by providing highways and automobiles with equipment which can improve traffic flow and provide for enhanced safety;

(8) high speed rail systems designed for long distance travel are expanding rapidly in Europe and Japan, but not in the United States;

(9) there is technical expertise in high speed rail in the United States but this expertise is waning because the United States does not build its own rail systems;

(10) magnetically levitated (maglev) trains, which, potentially, could supplement and be as efficient as air travel between major cities in the United States, have been developed and tested in Canada, Germany, Great Britain, Japan, and the Soviet Union, but have not been developed to a state-of-the-art which could make them commercially viable, as evidenced by the fact that no current projects are underway to build a commercial operating maglev system in any country, primarily because of the high capital cost associated with the state of the technology;

VALENT023

(11) high speed rail, maglev, and air transport are inefficient when passengers cannot get to the stations and terminals without using private automobiles, or buses that are inefficient, slow, polluting, and energy intensive, making research in short haul passenger transportation systems an important priority;

(12) the Federal Government spends very little time and effort on research and development programs to improve the efficiency and safety of existing highway and rail-based surface transportation systems or to increase the useful life while decreasing the life cycle costs of their infrastructure;

(13) research and development programs related to surface transportation are fragmented and dispersed throughout government, and need to be strengthened and incorporated in an integrated framework within which a consensus on the goals of a national surface transportation research and development program must be developed;

(14) the inability of government agencies to cooperate effectively, the difficulty of obtaining public support for new systems and rights-of-way, and the high cost of capital financing discourage private firms from investing in the development of new transportation equipment and systems; therefore the Federal Government

should sponsor and coordinate research and development of new technologies to provide safer, more convenient, and affordable transportation systems for use in the future; and

(15) an effective high technology applied research and development program should be implemented quickly by strengthening the Department of Transportation research and development staff and by contracting with private industry for specific development projects.

SEC. 3. SURFACE TRANSPORTATION RESEARCH AND DEVELOPMENT PLAN.

(a) PLAN.--The Secretary of Transportation (hereafter in this Act referred to as the ``Secretary'') shall develop an integrated national plan (hereafter in this Act referred to as the ``Plan'') for surface transportation research and development, including details of the programs described in section 4, with provisions for appropriate funding levels and a schedule with milestones, preliminary cost estimates, appropriate work scopes, personnel requirements, and estimated costs and goals for the next 3 years for each area of research and development. The Plan shall also include a 10-year projection of long-term research and development. Recommendations for the appropriate source or mechanism for surface transportation research and development funding, taking into account the recommendations of the Research and Development Coordinating Council of the Department of

Transportation shall also be included. The initial Plan shall be submitted to the Congress by January 15, 1992. The Plan shall be reviewed and updated, with comments and recommendations submitted to the Congress, annually. The Plan shall focus on those surface transportation systems needed for future urban, suburban, and rural areas in the next decade. A primary component of the Plan shall be cooperation with industry in carrying out section 4 and to strengthen the manufacturing capabilities of United States firms in order to produce products for surface transportation systems. In any case where a different technology or alternative program can accomplish the same or better results than those described in section 4, the Secretary may make recommendations for the alternative, and shall promptly report such recommendations to the Congress.

(b) CONFORMANCE WITH PLAN.--All surface transportation research and development within the Department of Transportation shall be included in the Plan and shall be evaluated in accordance with the Plan.

(c) OBJECTIVES OF PLAN.--The Plan shall provide for the development of a range of technologies, within the shortest time possible, needed to produce convenient, safe, affordable, modes of surface transportation to be available for public use beginning in the mid 1990's, and for maintaining a long-term advanced research and development

program to provide for next generation surface transportation systems.

(d) COORDINATION.--In developing the plan and in carrying out section 4, the Secretary shall consult with and, where appropriate, use the expertise of other Federal agencies and their laboratories.

SEC. 4. RESEARCH AND DEVELOPMENT PROGRAMS.

(a) AUTOMOTIVE.--The Secretary shall initiate highway vehicle research, development, and testing programs in conjunction with industry for the further improvement of vehicle structures in order to reduce impact loads on the occupants during collisions, for the continuing development of energy-absorbing structures, and to reduce the number and severity of collisions. Such programs shall include--

(1) a composite structures research and development program;

(2) a program for research, development, and prototype testing of a system to partially activate braking systems or sound a warning when the closing speed of a vehicle is too fast relative to the proximity to other vehicles;

(3) further measures, including a computer model, to examine and test the dynamics of trucks with multiple trailers, capable of determining the mass acceleration and deceleration characteristics of various load

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combinations under all likely maneuvering and braking situations; and

(4) a research and development program for the purpose of developing an electronic system for use on police vehicles capable of quantifying reckless driving.

(b) INTELLIGENT VEHICLE HIGHWAY SYSTEMS.--The Secretary shall develop a completely automated highway and vehicle system which can become the standard model such that all vehicles in the United States can operate on automated highways in all of the contiguous United States. Such development shall include research in human factors to ensure the success of the man-machine relationship. The goal of this program is to have the first fully automated roadway in operation by the end of 1997. This system shall accommodate installation of equipment in new and existing motor vehicles.

(c) HIGH SPEED RAIL SYSTEMS.--

(1) REVIEW OF LITERATURE.--The Secretary shall review all available technical literature pertaining to the French, German, and Japanese high speed rail systems and consult with engineers involved in those systems for the purpose of preparing for the introduction of high speed rail systems in the United States. This review shall include construction technologies, including track placement robotics, power transfer technologies, and rail maintenance technologies unique to high speed rail

systems.

(2) RECOMMENDATION.--After completing the review under paragraph (1), the Secretary shall recommend the most appropriate high speed rail system technologies for constructing high speed rail systems in the United States which are to such standards and compatibility so as to facilitate their interconnection across the country in the future. The Plan shall describe the Secretary's findings and identify requirements for additional research and development.

(3) COMMENTS ON INDUSTRIAL POTENTIAL.--The Secretary shall prepare comments concerning the potential for rebuilding United States industrial strength in rail technologies. Such comments should carefully appraise the engineering and manufacturing potential of United States industries, including suppliers, and identify management, labor, equipment, and facility shortcomings. Such comments shall be submitted to the Congress by July 1, 1992.

(d) MAGNETICALLY LEVITATED TRAINS.--The Secretary shall propose and conduct a comprehensive applied research and development program on magnetically levitated trains, through a lead Magnetic Levitation Research and Development Center, including an investigation of the possibility of international cooperation using superconducting magnet

systems. The Secretary shall keep informed of progress in on-going research on high temperature superconducting materials in expectation of significant progress in that field of basic research. The program proposed under this subsection shall address--

(1) coach design minimizing weight while retaining a high degree of passenger comfort, including provisions for shielding against electromagnetic radiation;

(2) advanced propulsion and levitation systems using superconducting materials;

(3) reducing the capital cost of magnetic levitation, including emphasis on research on guideway configuration, materials, and automated manufacturing techniques; and

(4) in conjunction with the National Aeronautics and Space Administration, computer analysis and wind tunnel verification to determine the aerodynamic stability of magnetically levitated vehicles under all anticipated operating and wind conditions.

(e) SHORT HAUL PASSENGER TRANSPORTATION SYSTEMS.--The Secretary shall conduct necessary systems research in order to develop a concept for a lightweight, rubber-tired multiple-unit system powered by deep discharge batteries in conjunction with recharging stations beneath paved roadways at strategic locations. The Secretary shall create a potential systems concept and, as part of the Plan, shall

make recommendations to the Congress by July 1, 1992.

(f) SUPPORTING INFRASTRUCTURE.--The Secretary shall strengthen and expand surface transportation infrastructure research and development. The expanded program shall including the following elements:

(1) Methods and materials for improving the durability, thereby extending the life of bridge structures, including new and innovative technologies to reduce corrosion.

(2) Expansion of the Department of Transportation's inspection and mobile nondestructive examination capabilities, including consideration of the use of high energy field radiography for more thorough and more frequent inspections of bridge structures as well as added support to State highway departments.

(3) The development of a concept for robotic highway and road repair machinery consisting of a highly mobile unit with the capability for removing bituminous paving and concrete and replacing the damaged material using nonlabor intensive technologies and which would result in a durable, smooth, and level surface.

(4) The Secretary shall conduct a research and development program on new materials which are compatible with technologies developed under paragraph (3) and will set rapidly, support heavy wheel loadings, and retain

structural integrity through repeated loading cycles over a minimum of 10 years of high volume use.

(5) The Secretary shall determine whether to initiate a construction equipment research and development program directed toward the reduction of costs associated with the construction of highway and mass transit systems. The results of the inquiry shall be submitted to the Congress by July 1, 1992.

(6) In conjunction with a university or universities, the use of computer simulation techniques to study the dynamics of high speed rail and magnetically levitated train systems acting on bridge and elevated guideway structures. This effort shall be directed toward the eventual reduction of the initial and maintenance costs, and to the extension of the useful life, of such structures.

(7) The Secretary shall review Department of Transportation and State construction contracting policies and submit a report to Congress by October 1, 1992, containing recommendations to reduce the time and cost of repairing and building transportation facilities. Emphasis shall be placed on a review and assessment of the merits of policies which would provide bonuses to contractors and to their employees for completing projects on very short schedules in conformance with

technical specifications.

SEC. 5. RESEARCH ADVISORY COMMITTEE.

(a) ESTABLISHMENT.--Not later than 180 days after the date of enactment of this Act, the Secretary shall establish an independent surface transportation research advisory committee.

(b) PURPOSES.--The advisory committee shall provide ongoing advice and recommendations to the Secretary regarding needs, objectives, plans, approaches, content, and accomplishments with respect to short-term and long-term surface transportation research and development. The advisory committee shall also assist in ensuring that such research and development is coordinated with similar research and development being conducted outside of the Department of Transportation.

(c) MEMBERSHIP.--The advisory committee shall be composed of not less than 20 and not more than 30 members appointed by the Secretary from among persons who are not employees of the Department of Transportation and who are specially qualified to serve on the committee by virtue of their education, training, or experience. A majority of the members of the advisory committee shall be individuals with experience in conducting surface transportation research and development. The Secretary in appointing the members of the advisory committee shall ensure that universities, corporations,

associations, consumers, and other Federal and State Government agencies are represented on an equitable basis.

(d) CHAIRMAN.--The Chairman of the advisory committee shall be designated by the Secretary.

(e) PAY AND EXPENSES.--Members of the advisory committee shall serve without pay, except that the Secretary may allow any member, while engaged in the business of the advisory committee or a subordinate committee, travel expenses, including per diem in lieu of subsistence, in accordance with sections 5702 and 5703 of title 5, United States Code.

(f) SUBORDINATE COMMITTEES.--The Secretary may establish subordinate committees to the advisory committee to provide advice on specific areas of surface transportation research and development. Such subordinate committees shall be subject to subsections (e), (g), and (i) of this section.

(g) ASSISTANCE OF SECRETARY.--Upon request of the advisory committee, the Secretary shall provide such information, administrative services, support staff, and supplies as the Secretary determines are necessary for the advisory committee to carry out its functions.

(h) REPORTS.--The advisory committee shall, within one year after the date of enactment of this Act and annually thereafter, submit to the Congress a report summarizing its activities under this section.

(i) TERMINATION.--Section 14 of the Federal Advisory

Committee Act shall not apply to the advisory committee established under this section.

SEC. 6. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated to the Secretary for surface transportation research and development--

(1) for fiscal year 1992, $164,500,000, of which at least 8 percent shall be for the programs described in section 4;

(2) for fiscal year 1993, $180,000,000, of which at least 10 percent shall be for the programs described in section 4; and

(3) for fiscal year 1994, $200,000,000, of which at least 15 percent shall be for the programs described in section 4.

SUMMARY OF SURFACE TRANSPORTATION R&D BILL

SECTION 1 TITLE

The Surface Transportation Research and Development Act of 1991

SECTION 2 FINDINGS

Despite an annual expenditure in excess of $10 billion on surface transportation and its infrastructure, the Federal Government has not developed a clear vision of how surface transportation systems of the 21st century will differ from the present, how such systems will interface with each other, how they will adjust to changing demographics, or the role of federally funded research and development in preparing for the systems of the future.

Eighteen million automobile crashes, 4 million injuries and 45 thousand fatalities a year clearly indicate a need for R&D to improve safety on the highways.

There has been a shortfall in R&D funding for surface transportation for many years. This insufficient funding has resulted in increasing dependence on foreign technologies. As one example, the currently planned high speed rail system for Texas is to be built with French technology.

A more highly focused and cooperative effort including government, industry, the national laboratories and universities is urgently needed.

Current surface transportation research and development programs are fragmented and dispersed throughout the government. They need to be strengthened and incorporated in an integrated framework within which a consensus on national goals can be reached.

SECTION 3 SURFACE TRANSPORTATION RESEARCH AND DEVELOPMENT PLAN

The bill would require the Secretary of the Department of Transportation to develop a 3 year plan complete with goals, cost estimates, schedules and other pertinent information, which is to be submitted the Congress by January 15, 1992.

This plan is also to include certain specific R&D programs which are described in Section 4 of the bill.

SECTION 4 SPECIFIC RESEARCH AND DEVELOPMENT PROGRAMS

The specific R&D programs include: research and development in automotive safety through the development of composite structures (automobile bodies) which can absorb a greater amount of energy in a collision; automotive sensing systems which activate brakes or otherwise warn a driver when approaching another vehicle or obstruction at too great a speed; research in multiple trailer trucks to assess the behavioral characteristics under various loading and road conditions; a sensing system to detect reckless driving; a technical investigation of foreign high speed rail systems; a strong program in magnetically levitated train systems to reduce the cost of such systems, lessen their susceptibility to vandalism, investigate the potential effects of electromagnetic radiation and reduce maintenance; research and development for a "short-haul" passenger transportation system for urban/suburban use as a system for the future to replace busses; and various programs for extending the useful life of bridge and highway structures, decreasing the construction time in making repairs to the infrastructure and drafting policies and procedures for encouraging more rapid progress on construction projects related to surface transportation infrastructure.

SECTION 5. RESEARCH ADVISORY COMMITTEE

The Secretary shall establish an independent research and advisory committee for the purpose of bringing industry, government, and universities together and provide guidance to R&D programs which will enable the U.S. to regain its technological leadership in an industry so vital to our economic welfare.

SECTION 6. AUTHORIZATION OF APPROPRIATIONS

$164.5 million is included in the Administration's budget request for R&D in FY 1992 for the Department of Transportation. The Bill calls for an 8 percent set aside for the programs identified in Section 4. The set aside would amount to $13 million. Depending on future DOT budget requests, anticipate $27 million in FY 1993 and $35 million in FY 1994.

Mr. VALENTINE. The subcommittee will come to order and we will try to get started.

We have before the subcommittee today for markup H.R. 2941.

Today's markup is the culmination of a great deal of work by the Subcommittee on Technology and Competitiveness and the former Subcommittee on Transportation, Aviation, and Materials of the Committee on Science, Space, and Technology. Over the past 5 years, these subcommittees have held hearings on a wide variety of surface transportation technologies.

This year, we have worked to put that accumulated knowledge to good use by writing legislation to enhance transportation research and development within the Department of Transportation. In my opinion, the bill before us does a respectable job of outlining the steps our government must take to help U.S. industry once again become a serious player in all the key aspects of surface transportation research and development.

The past decade has been filled with technological marvels in materials, in electronics, in our understanding of basic physics, and in computing technology. Much of this knowledge has direct applications to improving our transportation infrastructure and the vehicles that travel in and on it. New materials can lead to better highways and bridges, better engines, and lighter, stronger vehicle bodies. The wonders of superconductivity could revolutionize intercity transportation. Much of the electronics necessary for smart highways already exists. We have only begun to harness the contributions computers can make to safer transit.

Yet, these improvements will not occur automatically, and realistic planning and government cooperation with industry on research and technology development must occur before any of these new wonders can be stamped, "Made in the USA". As Germany has moved into maglev and as Japan has perfected its bullet trains, the United States industry often has remained on the sidelines, importing rather than producing much of the transportation high technology that is currently found within the United States.

This is too important a market sector to ignore. Too many high quality jobs are at stake. We badly need an increased American presence in transportation high technology.

This bill takes the first steps in that direction. By requiring an annual research plan from the Secretary of Transportation and by tying the Department of Transportation's research programs to that plan, a new cohesion in surface transportation research efforts should occur. The annual review of the plan, both inside and outside the government, should lead to a more comprehensive, intermodal approach to our surface transportation systems of the future. The bill asks the Department to begin programs to promote the development of a number of important transportation technologies which were identified in our expert testimony and in recent studies of our transportation research needs.

We cannot wait any longer to take these steps.

Before I recognize the other members of the committee, I would like to express appreciation to the Ranking Member of our subcommittee, Mr. Lewis, who is not able to be here today but is ably represented by our good friend and colleague, Mr. Henry. Mr. Lewis probably will propose a number of—as I understand, will propose a

number of amendments, which are probably in the nature of improvements to this legislation. We will cross that bridge when we get to it. I don't believe that any of these proposed changes are substantive.

Therefore, before I recognize Mr. Henry, let me say that without objection, the draft of H.R. 2941, the Surface Transportation Research and Development Act of 1991, dated July 18, 1991, which appears before you, will be considered original text for purposes of this markup, unless there is some objection.

[The prepared opening statement of Mr. Valentine follows:]

Opening Remarks
Honorable Tim Valentine
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H.R. 2[illegible]1
Surface Transportation Research and
Development Act of 1991

July 18, 1991

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We cannot wait any longer to take these steps, since we, as taxpayers, have a tremendous stake and that stake is not just jobs. If we could extend the life of the average highway a mere two years before resurfacing, the American taxpayers would save many times the cost of the entire transportation research program envisioned in this bill. And this is just one of the savings this bill could produce. Therefore, I urge my colleagues to look at the possibilities that enhanced transportation research can bring and to give this bill their wholehearted support.

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Before I recognize other members, I would like to take care of one housekeeping matter. Mr. Lewis has proposed a number of small, clarifying improvements in the draft of this legislation that was mailed to each member of the subcommittee. None of these changes were substantive in nature, so we asked the Office of Legislative Counsel to incorporate them in the version of this legislation which appears before you. Therefore, without objection, the draft of H.R. 2491, the Surface Transportation Research and Development Act of 1991, dated July 18, 1991, which appears before you, will be considered original text for purposes of this markup.

Mr. VALENTINE. I will recognize at this time, Mr. Paul Henry.

Mr. HENRY. Thank you, Mr. Chairman.

I wanted to thank you, as well as the Ranking Member, Mr. Lewis, for expeditiously moving this measure forward. I also would be remiss if I didn't express appreciation to all our professional staff who have cooperated very ably with us. I particularly acknowledge Mr. Jim Greene for his hard work as well and his assistance in shaping this legislation.

I am sure our former full committee chairman, Mr. Roe, would agree that a strong R&D title should be an integral component of the surface transportation reauthorization bill. When I look at the enormous infrastructure dilemma currently facing our country, I can't help but think that greater planning and long-term research and development could have prevented or mitigated some of these problems.

I also believe that a strong R&D title can help our Nation's transportation manufacturing industries compete in the world marketplace. The Surface Transportation Act will authorize billions of dollars in spending. Our communities will be improving their rail systems and bus fleets. They will be repairing roadways and bridges.

But it is deplorable to think that our communities might continue to turn to Europe and Asia to purchase mass transit equipment and automobiles. We need look no further than our doorstep for some glaring examples.

I am safe in stating that many of us in this room today rode today in an Italian subway car. Perhaps some people here today are looking forward to soon leaving their German or Japanese cars at home, and commuting on the Virginia Rail Express. But they will be riding on a Japanese train assembled in Brazil.

As you know, Mr. Chairman, I have a strong interest in the plight of our Nation's automobile and auto manufacturing industries. And as you also know, we live in an era of an excess of worldwide auto-making capacity. Piled atop intense global competition, our current economic downturn and ongoing trade barriers exist.

Japanese auto firms have viewed Detroit's difficulties as a great strategic opportunity, and are poised to gain even more U.S. market share. Why, just a few weeks ago, Mr. Chairman, the Commerce Department released a price survey of auto parts showing that Japanese companies are keeping prices high at home and low in the United States, effectively using their protected home market to subsidize their penetration of the North American market. And new evidence suggests that Honda has overstated U.S. content to qualify for duty-free import of Honda Civics from Canada.

While these matters are outside the direct purview of what we are trying to do with this legislation, Mr. Chairman, they are indeed relevant. Over the years, the U.S. Government has provided very little R&D support to our domestic auto manufacturing industry. The Department of Transportation's R&D budget represent a mere 1 percent of its total budget, with virtually no money being spent on long-term R&D, let alone auto-related R&D. I will be offering two amendments today which seek to redirect our priorities.

My amendments will direct DOT to broaden its R&D efforts by speeding the commercial development of new manufacturing proc-

esses, processes such as advanced driver information systems, automated control systems, and advanced materials technologies. If we have learned anything in competing with Japan, Mr. Chairman, it's that our products and technology are only as good as our ability to produce them. That is why I have specifically included language regarding the development of new manufacturing processes.

My amendment requires DOT to establish an Automotive Research Advisory Committee made up of representatives from academia, industry, and other government agencies. Obviously, the manufacturing expertise of the National Institute of Standards and Technology ought to be tapped as well. And for that matter, the Department of Energy's work on battery and alternative energy sources should also be utilized.

The role of this advisory panel would be to coordinate the research being conducted in our Federal labs, our universities, and other research centers, and to translate any relevant research toward auto-related R&D. This panel would also identify long-term auto R&D needs.

In closing, I want to point out that the U.S. auto industry is the largest consumer—the largest consumer—of semiconductor chips. It also uses vast numbers of sophisticated machine tools, robots, computers, and advanced materials. Without a strong U.S. auto industry, these other high-tech domestic industries would be threatened as well.

I don't think anyone doubts that the automobile will continue to be the primary mode of transportation in the coming century. Yet today we face serious doubt as to whether or not America will be the leader in producing these vehicles. Hopefully, this legislation will help put these doubts to rest.

And Mr. Chairman, I want to thank you for your support, your interest, and your concern over these issues as well.

Thank you.

[The prepared opening statement of Mr. Henry follows:]

OPENING STATEMENT

OF

THE HONORABLE PAUL B. HENRY (R-MI)

JULY 18, 1991

BEFORE THE SUBCOMMITTEE ON TECHNOLOGY & COMPETITIVENESS

MARKUP OF THE SURFACE TRANSPORTATION R&D ACT

MR. CHAIRMAN, I WANT TO THANK YOU AND THE RANKING MEMBER, MR. LEWIS, FOR EXPEDITIOUSLY MOVING THIS MEASURE FORWARD. I ALSO WANT TO THANK OUR MINORITY STAFFER JIM GREENE FOR HIS HARD WORK AND ASSISTANCE IN SHAPING THIS LEGISLATION.

I AM SURE OUR FORMER FULL COMMITTEE CHAIRMAN, MR. ROE, AGREES THAT A STRONG R&D TITLE SHOULD BE AN INTEGRAL COMPONENT OF THE SURFACE TRANSPORTATION REAUTHORIZATION BILL. WHEN I LOOK AT THE ENORMOUS INFRASTRUCTURE DILEMMA CURRENTLY FACING OUR COUNTRY, I CAN'T HELP BUT THINK THAT GREATER PLANNING AND LONG-TERM RESEARCH AND DEVELOPMENT COULD HAVE PREVENTED OR MITIGATED SOME OF THE PROBLEMS.

I ALSO BELIEVE THAT A STRONG R&D TITLE CAN HELP OUR NATION'S TRANSPORTATION MANUFACTURING INDUSTRIES COMPETE IN THE WORLD MARKETPLACE. THE SURFACE TRANSPORTATION ACT WILL AUTHORIZE BILLIONS OF DOLLARS IN SPENDING. OUR COMMUNITIES WILL BE IMPROVING THEIR RAIL SYSTEMS AND BUS FLEETS. THEY WILL BE REPAIRING ROADWAYS AND BRIDGES.

BUT, IT IS DEPLORABLE TO THINK THAT OUR COMMUNITIES MIGHT

CONTINUE TO TURN TO EUROPE AND ASIA TO PURCHASE MASS TRANSIT EQUIPMENT AND AUTOMOBILES. WE NEED LOOK NO FURTHER THAN OUR DOORSTEP FOR SOME GLARING EXAMPLES.

I AM SAFE IN STATING THAT MANY OF US IN THIS ROOM RODE TO WORK TODAY IN AN ITALIAN SUBWAY CAR. PERHAPS SOME PEOPLE HERE TODAY ARE LOOKING FORWARD TO SOON LEAVING THEIR GERMAN OR JAPANESE CARS AT HOME, AND COMMUTING ON THE VIRGINIA RAIL EXPRESS. BUT THEY'LL BE RIDING ON A JAPANESE TRAIN ASSEMBLED IN BRAZIL!

AS YOU KNOW, MR. CHAIRMAN, I HAVE A STRONG INTEREST IN THE PLIGHT OF OUR NATION'S AUTOMOBILE AND AUTO MANUFACTURING INDUSTRIES. AND AS YOU ALSO KNOW, WE LIVE IN AN ERA OF AN EXCESS OF WORLDWIDE AUTOMAKING CAPACITY. PILED ATOP INTENSE GLOBAL COMPETITION --- OUR CURRENT ECONOMIC DOWNTURN AND ONGOING TRADE BARRIERS.

JAPANESE AUTO FIRMS HAVE VIEWED DETROIT'S DIFFICULTIES AS A GREAT STRATEGIC OPPORTUNITY, AND ARE POISED TO GAIN EVEN MORE U.S. MARKET SHARE. WHY, JUST A FEW WEEKS AGO, MR. CHAIRMAN, THE COMMERCE DEPARTMENT RELEASED A PRICE SURVEY OF AUTO PARTS SHOWING THAT JAPANESE COMPANIES ARE KEEPING PRICES HIGH AT HOME AND LOW IN THE UNITED STATES, EFFECTIVELY USING THEIR PROTECTED HOME MARKET TO SUBSIDIZE THEIR PENETRATION OF THE NORTH AMERICAN MARKET. AND NEW EVIDENCE SUGGESTS THAT HONDA HAS OVERSTATED U.S. CONTENT TO QUALIFY FOR DUTY-FREE IMPORT OF HONDA CIVICS FROM CANADA.

WHILE THESE MATTERS ARE OUTSIDE THE DIRECT PURVIEW OF WHAT WE ARE TRYING TO DO WITH THIS LEGISLATION, MR. CHAIRMAN, THEY ARE RELEVANT. OVER THE YEARS, THE U.S. GOVERNMENT HAS PROVIDED VERY

LITTLE R&D SUPPORT TO OUR DOMESTIC AUTO MANUFACTURING INDUSTRY. THE DEPARTMENT OF TRANSPORTATION'S R&D BUDGET REPRESENTS A MERE 1% OF ITS TOTAL BUDGET, WITH VIRTUALLY NO MONEY BEING SPENT ON LONG-TERM R&D -- LET ALONE AUTO-RELATED R&D. I WILL BE OFFERING TWO AMENDMENTS TODAY, MR. CHAIRMAN, WHICH SEEK TO REDIRECT OUR PRIORITIES.

MY AMENDMENTS WILL DIRECT D-O-T TO BROADEN ITS R&D EFFORTS BY SPEEDING THE COMMERCIAL DEVELOPMENT OF NEW MANUFACTURING PROCESSES. PROCESSES SUCH AS ADVANCED DRIVER INFORMATION SYSTEMS, AUTOMATED CONTROL SYSTEMS, AND ADVANCED MATERIALS TECHNOLOGIES. IF WE HAVE LEARNED ANYTHING IN COMPETING WITH JAPAN, MR. CHAIRMAN, IT'S THAT OUR PRODUCTS AND TECHNOLOGY ARE ONLY AS GOOD AS OUR ABILITY TO PRODUCE THEM. THAT IS WHY I HAVE SPECIFICALLY INCLUDED LANGUAGE REGARDING THE DEVELOPMENT OF NEW MANUFACTURING PROCESSES. ~~IT~~ REAL~~IZE D~~-O-T ~~MAY~~ NOT HAVE ANY PARTICULAR EXPERTISE IN THIS AREA~~,~~. ~~HOWEVER~~, MY AMENDMENT ALSO REQUIRES D-O-T TO ESTABLISH AN AUTOMOTIVE RESEARCH ADVISORY COMMITTEE MADE UP OF REPRESENTATIVES FROM ACADEMIA, INDUSTRY, AND OTHER GOVERNMENT AGENCIES. OBVIOUSLY, THE MANUFACTURING EXPERTISE OF THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY OUGHT TO BE TAPPED, AS WELL. AND FOR THAT MATTER, THE DEPARTMENT OF ENERGY'S WORK ON BATTERY AND ALTERNATIVE ENERGY SOURCES SHOULD ALSO BE USED.

THE ROLE OF THIS ADVISORY PANEL WOULD BE TO COORDINATE THE RESEARCH BEING CONDUCTED IN OUR FEDERAL LABS, OUR UNIVERSITIES AND OTHER RESEARCH CENTERS, AND TO TRANSLATE ANY RELEVANT RESEARCH TOWARD AUTO-RELATED R&D. THIS PANEL WOULD ALSO IDENTIFY LONG-TERM AUTO R&D NEEDS.

IN CLOSING, I WANT TO POINT OUT THAT THE U.S. AUTO INDUSTRY IS THE LARGEST CONSUMER OF SEMI-CONDUCTOR CHIPS, MR. CHAIRMAN. IT ALSO USES VAST NUMBERS OF SOPHISTICATED MACHINE TOOLS, ROBOTS, COMPUTERS, AND ADVANCED MATERIALS. WITHOUT A STRONG U.S. AUTO INDUSTRY, THESE "HIGH-TECH" DOMESTIC INDUSTRIES COULD BE THREATENED AS WELL.

I DON'T THINK ANYONE DOUBTS THAT THE AUTOMOBILE WILL CONTINUE TO BE THE PRIMARY MODE OF TRANSPORTATION IN THE NEW CENTURY, MR. CHAIRMAN. YET TODAY WE FACE SERIOUS DOUBT AS TO WHETHER OR NOT AMERICA WILL BE THE LEADER IN PRODUCING THESE VEHICLES. HOPEFULLY, THIS LEGISLATION WILL HELP PUT THESE DOUBTS TO REST.

Mr. VALENTINE. Thank you, Mr. Henry.

The chair recognizes at this time, the gentleman from Arkansas, Mr. Thornton, for an opening statement.

Mr. THORNTON. I have no opening statement, Mr. Chairman. Thank you.

Mr. VALENTINE. Thank you. I will now recognize the ranking member of the subcommittee, who has joined us since we started, Mr. Lewis, for an opening statement.

Mr. LEWIS. Thank you, Mr. Chairman.

I would like to include my statement for the record, but I want to thank you for your cooperation and bipartisan spirit in the work that you've done on this legislation and it's due to your leadership that the subcommittee is advancing into the important area of surface transportation research. I want to express my appreciation, as well, to the staff, both majority and minority, who have worked hard to include the provisions that the subcommittee members wanted in this area.

Mr. Chairman, it's not enough for me to go around for the next few hours. After this vote, it's absolutely mandatory that I be in Agriculture for the markup there. It's very important to my State, so I will be back and forth the rest of the afternoon.

[The prepared opening statement of Mr. Lewis follows:]

Hon. Tom Lewis (R-FL)
Opening Statement
Surface Transportation Research Markup
July 18, 1991

Thank you Mr. Chairman.

Today's markup of the Surface Transportation Research Act is one of the most important markups ever for the Subcommittee and its predecessors. We are addressing a research area that is vital for the economic growth and competitiveness of the nation.

The Subcommittee held three days of hearings on surface transportation research. Witnesses and technical reports, such as the Office of Technology Assessment studies, have given the Subcommittee guidance in preparing both the legislation and the amendments before us today.

The June 1991 OTA report "Moving Ahead: 1991 Surface Transportation Legislation" concludes that, "Congress could consider requiring the Department of Transportation to undertake a comprehensive, departmental wide, in-debth review of surface R&D programs with the goal of developing a strategic R&D plan." That is included in Section 3 of the bill before us.

The report goes on to say that, "Long-range planning and R&D that look ahead to future problems simply do not exist at DOT, and this is a serious deficiency." Several sections address this, including Section 3 of the bill and an amendment I will offer on long-range R&D funding.

The statistics on the state of disrepair of the surface transportation system are readily available. When the Federal Interstate system was being built 35 years ago, bridge engineers decided that the decking on interstate bridges should be 6 and 1/2 inches thick. There was no research on which to base this data only educated guesses. As it turns out, the correct thickness should have been 8 inches in order to withstand today's traffic.

The consequence of this one and one-half inch error is that 28.6 percent of the nation's 53,183 interstate highway bridges are deficient in some way. I have an amendment to mandate long-term research in infrastructure technology, which will save millions of tax payers dollars. The savings will be realized because if the job is done, based on the results of sound scientific research, the bridges and infrastructure will last longer and need frwer repairs.

Finally, Mr. Chairman, several other Subcommittee Members, including Mr. Walker, Mr. Henry and Mr. Ritter, have amendments that will be offered. I have read each one and think they are important and needed in the bill. Furthermore, all were addressed in the three days of hearings before the Subcommittee and, to my knowledge, there were no objections to the legislation included in the amendments.

Mr. Chairman, I want to thank you for your cooperation and the bipartisan spirit in which you worked on this legislation. It is due to your leadership that the Subcommittee is advancing into the important area of surface transportation research. Furthermore, I want to express my appreciation to the staff, both majority and minority, who have worked hard to include the provisions that the Subcommittee Members wanted to add.

I urge my colleagues to support this legislation and the amendments I have discussed.

Thank you Mr. Chairman.

Mr. VALENTINE. Thank you, Mr. Lewis. Of course, we understand that. Would you take care of the interests of the Science Committee before the Ag Committee?

Mr. Lewis. Yes, sir.

Mr. VALENTINE. The chair recognizes at this time Mr. Tanner.

Mr. TANNER. Thank you, Mr. Chairman.

I don't have an opening statement at this time, due to the impending vote.

Thank you, sir. [Laughter.]

Mr. VALENTINE. Thank you. I can't compete with that. Thank you very much.

Mr. Gilchrest, do you have an opening statement?

Mr. GILCHREST. Thank you, Mr. Chairman. I have no opening statement at this time.

Mr. VALENTINE. Mr. Roemer is not here, but without objection, at his request we will submit our colleague Mr. Roemer's statement for the record and recognize the lady from Maryland, Mrs. Morella.

[The prepared opening statement of Mr. Roemer follows:]

Opening remarks for Rep. Tim Roemer, Subcommittee Mark-up of the Surface Transportation R&D Bill

Mr. Chairman, I would like to complement you and the Ranking Republican Member, Mr. Lewis, on your hard work and leadership on this critical issue, and I am proud to join you as an original cosponsor of this legislation, H.R. 2941.

The needs of an ever expanding population are complex, perhaps none so much as transportation. More people need to reach longer distances in shorter periods of time. Solutions must consider many elements, among them pollution, safety, human congestion, and budgetary constraints.

By fostering cooperation between government, industry, our national labs and the university system, we not only get the best return on our research dollar, but sharpen our ability to compete with foreign technologies.

While we need safer, more efficient cars, building cars alone is not enough.

Advancing high speed rail systems, developing affordable MAGLEV trains, mechanizing auto safety, and creating convenient, efficient, and non-polluting short-haul transportation are critical to our future.

For example, improved transportation between area cities and local airports would ease congestion at larger airports considerably. In my district, we have one of the finest regional airports in the country. A combination of light rail and dependable short-haul transportation would not only help a regional airport prosper, but would be a significant benefit to commuter, regional, national and even international travelers.

This scenario is one among many benefits the research created in this bill might produce. Clearly, our needs for the future cannot be met by existing technology, and now is the time to begin to address our requirements for the next century.

Again, I would like to salute the Chairman and my colleagues on this Committee for outstanding leadership in this field.

Mrs. MORELLA. I have no opening statement.

Mr. VALENTINE. Thank you.

We will run for another 5 minutes or so, unless somebody has objection, and see how much we can get done before we have to leave.

I will recognize at this time Mr. Williams, if you will give us an explanation of the measure before us.

Mr. WILLIAMS. Yes, sir.

The bill is a comprehensive R&D bill, as it stands. We have included Section 3, which calls for the DOT to proceed in the development of a policy and a firm plan for carrying out future research and development within the Department. The plan also calls for submissions to the Congress by July 15th of next year so that we can evaluate the progress that the DOT is making in this regard.

The plan then also incorporates, via Section 4, a number of technologies. The first technology is automotive. As Mr. Henry has mentioned, this is a very vital technology. What we're asking for here is a very thorough research program involving composite structures and the behavior of these structures, particularly during impact. What we're looking for is a better understanding of the energy absorbing qualities of various composites. The automobile companies have done some of this on their own, but I think via the national laboratories we can add a good deal to it.

Intelligent vehicle highway systems, known as IVHS, is included. We have not included in the language reference to traffic control systems, displays in vehicles, and various technologies that are already available. What we have done is gone out—and I guess have been a little bit more bold—what we're asking them to do is take a look at the ultimate, a completely automated highway system for the future.

This also involves a human factors engineering effort so that a man-machine reference, as it is called, can be worked out. People in the public are sometimes shy about a new technology, and so they should be, particularly in a case such as this. So the program is all encompassing to that degree.

We do have also high speed rail, recognizing that high speed rail is fairly well-developed technology. The Germans are—the Europeans, rather—are planning to put in between 4,800 and 5,000 miles of high speed rail systems in Europe. What we are looking for is some way our R&D is pointed at manufacturing, engineering, and some way to get U.S. industry——

Mr. VALENTINE. It's obvious, Mr. Williams, that we're not going to be able to complete this explanation. But we will have to recess for a few minutes—I hope everybody who is here can join us because this is a very important matter. There are two votes, so it will be a little longer than normal.

[Recess.]

Mr. VALENTINE. The subcommittee will be in order.

Mr. Williams, if you would resume your explanation.

Mr. WILLIAMS. Yes, sir. I will try to summarize.

There are three remaining programs in Section 4 that we have included. One is the magnetic levitation initiative. Our bill calls for strictly research and development as opposed to proceeding with

design, engineering, and any construction at this point in time because we want to make sure that it will be commercially viable.

Another item is the short haul passenger transportation system, which is an attempt to try to develop a system which is more convenient and efficient than the current use of diesel buses.

And the last item is an infrastructure R&D program which calls for better ways of non-destructive examinations of bridges, the development of new materials for highways, and also some unique construction machinery that will help expedite the repair and maintenance of highways.

The authorization calls for taking 8 percent of the money in the Administration's budget, which is $164.5 million. The 8 percent results in approximately $13.16 million for the work identified in Section 4.

Thank you, Mr. Chairman.

Mr. VALENTINE. Thank you, sir.

Mr. Henry, do you have any questions?

Mr. HENRY. No, no questions. Thank you, Mr. Williams.

Mr. VALENTINE. Mr. Thornton.

Mr. THORNTON. I have no questions. I appreciate the good explanation.

Mr. VALENTINE. All right, sir.

Then, if there are no questions, Mr. Williams, the chair will state that the bill is open for amendment. If any members have amendments, we will be glad to hear from them at this time.

Mr. HENRY. Mr. Chairman.

Mr. VALENTINE. Mr. Henry.

Mr. HENRY. Thank you.

On behalf of Mr. Lewis, I wonder if I would—Mr. Lewis has two amendments, and without objection, with unanimous consent, I would call for them en bloc.

Mr. VALENTINE. Without objection.

Mr. HENRY. Thank you.

The first amendment of Mr. Lewis deals with infrastructure issues and it includes the mandate that DOT conduct generic research on advanced infrastructure technology. The purpose is to ensure that research on new and innovative next generation replacements for existing infrastructure systems is conducted.

The second amendment, likewise, is a long-term research amendment. It would mandate that 15 percent of DOT's R&D budget is spent on projects of 10 years or longer. It parallels the long-term research provisions that are part of the Public Law for the Federal Aviation Administration.

[The amendments proposed by Mr. Lewis follow:]

LEWISF009

AMENDMENT TO THE COMMITTEE PRINT
OFFERED BY MR. LEWIS

Page 14, after line 1, insert the following new paragraph:

(8) The Secretary shall undertake or supervise surface transportation infrastructure research to develop--

(A) nondestructive evaluation equipment for use with existing structures and for the ``next generation'' structures that utilize advanced materials;

(B) information technologies, including--

(i) appropriate computer programs to collect and analyze data on the status of the existing infrastructure facilities for enhancing management, for growth, and for capacity; and

(ii) dynamic simulation models of surface transportation systems for predicting capacity, safety, and infrastructure durability problems, for evaluating planned research projects, and for testing the strengths and weaknesses of proposed revisions in surface transportation operations

programs; and

(C) new and innovative technologies to enhance and facilitate field construction and rehabilitation techniques for minimizing disruption during repair and maintenance of existing structures.

LEWISF010

AMENDMENT TO THE COMMITTEE PRINT
OFFERED BY MR. LEWIS

Page 16, after line 2, insert the following new section:

SEC. 6. LONG-TERM RESEARCH.

Not less than 15 percent of the amounts appropriated for surface transportation research and development shall be used for long-term research projects. The :erm ``long-term research project'', as used in this section, means a research project which is unlikely to be completed within 10 years.

Page 16, line 3, redesignate section 6 as section 7.

WALKER014

AMENDMENT TO THE COMMITTEE PRINT
OFFERED BY MR. WALKER

Page 16, after line 2, insert the following new section:

SEC. 6. ADVANCED AUTOMOTIVE CONFERENCE AND AWARD.

The Stevenson-Wydler Technology Innovation Act of 1980 is amended by inserting after section 17 the following new sections, and by redesignating subsequent sections and all references thereto accordingly:

"**SEC. 18. CONFERENCE ON ADVANCED AUTOMOTIVE TECHNOLOGIES.**

"Not later than 180 days after the date of enactment of the Surface Transportation Research and Development Act of 1991, the Secretary, through the Under Secretary of Commerce for Technology, in consultation with other appropriate officials, shall convene a conference of domestic motor vehicle manufacturers, parts suppliers, Federal laboratories, and motor vehicle users to explore ways in which cooperatively they can improve the competitiveness of the United States motor vehicle industry by developing new technologies which will enhance the safety and energy savings, and lessen the environmental impact, of domestic motor vehicles, and the results of such conference shall be published and then submitted to the President and to the

Committee on Science, Space, and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate.

``SEC. 19. ADVANCED MOTOR VEHICLE AWARD.

``(a) ESTABLISHMENT.--There is established a National Award for the Advancement of the Motor Vehicle. The award shall consist of a medal, and a cash prize if funding is available for the prize under subsection (c). The medal shall be of such design and materials and bear inscriptions as is determined by the Secretary of Transportation.

``(b) MAKING AND PRESENTING AWARD.--The Secretary of Transportation shall periodically make and present the award to domestic motor vehicle manufacturers, suppliers, or Federal laboratory personnel who, in the opinion of the Secretary of Transportation, have substantially improved the domestic motor vehicle in safety, energy savings, or environmental impact. No person may receive the award more than once every 5 years.

``(c) FUNDING FOR AWARD.--The Secretary of Transportation may seek and accept gifts of money from private sources for the purpose of making cash prize awards under this section. Such money may be used only for that purpose, and only such money may be used for that purpose.''.

Page 16, line 3, redesignate section 6 as section 7.

AMENDMENT TO THE COMMITTEE PRINT

OFFERED BY MR. HENRY

Page 9, after line 5, insert the following new subsection:

(b) ADVANCED AUTOMOTIVE TECHNOLOGIES.—(1) The Secretary shall support an industry-led research and development program to--

(A) develop generic, technologies that will advance the United States automotive industry in new technology;

(B) conduct long-term, high-risk basic research, jointly with academia, that would enhance United States competitiveness and facilitate industry's commercial adoption of advanced technologies; and

(C) foster the transfer of Advanced Manufacturing technologies by utilizing the regional manufacturing technology transfer program at the National Institute of Standards and Technology and other federal laboratories.

(2) The Secretary, in carrying out this subsection, may make grants to universities or other research organizations for conducting research and development activities.

Redesignate subsequent subsections, and all references thereto, accordingly.

HENRY033

AMENDMENT TO THE COMMITTEE PRINT
OFFERED BY MR. HENRY

Page 16, after line 2, insert the following new sections:

SEC. 6. RESEARCH AND DEVELOPMENT AUTHORITY OF SECRETARY OF TRANSPORTATION.

Section 301(5) of title 49, United States Code, is amended by inserting ``, and including basic automotive science'' after ``to aircraft noise''.

SEC. 7. PURPOSES OF DEPARTMENT OF TRANSPORTATION.

Section 101(b)(4) of title 49, United States Code, is amended by inserting ``, through research and development or otherwise'' after ``advances in transportation''.

Page 16, line 3, redesignate section 6 as section 8.

RITTER215

AMENDMENT TO THE COMMITTEE PRINT
OFFERED BY MR. RITTER

Page 10, after line 19, insert the following new paragraphs:

(4) EXAMINATION OF RESEARCH POTENTIAL.--The Secretary shall examine the potential of United States industries and universities to conduct research on and to participate in the development of high speed rail systems, including the potential to develop the ``next generation'' high speed rail transportation and produce a superior product that is competitive in the global marketplace.

(5) EXAMINATION OF TECHNICAL RESEARCH NEEDS.--The Secretary shall examine the significant unresolved research and development issues surrounding the design, engineering, construction, and operation of high speed rail transportation systems.

HENRY044

AMENDMENT TO THE COMMITTEE PRINT
OFFERED BY MR. HENRY

Page 15, lines 11 through 14, strike ``The Secretary may establish'' and all that follows through ``research and development.'' and insert in lieu thereof the following: ``The Secretary shall establish a subordinate committee to the advisory committee to provide advice on advanced automotive technology research and development, and may establish other subordinate committees to provide advice on specific areas of surface transportation research and development.''.

GILCHR010

AMENDMENT TO THE COMMITTEE PRINT
OFFERED BY MR. GILCHREST

Page 11, after line 18, insert the following:

The Secretary shall conduct a study of the generic research needed for, and the cost and technological feasibility of, developing a magnetic levitation system in the United States. ~~Such study shall include specific examples of proposed routes.~~

AMENDMENT TO THE COMMITTEE PRINT

OFFERED BY MR. HENRY

Page 9, after line 5, insert the following new subsection:

(b) ADVANCED AUTOMOTIVE TECHNOLOGIES.--(1) The Secretary shall support an industry-led research and development program to--

(A) develop generic technologies that will advance the United States automotive industry in new technology;

(B) conduct long-term, high-risk basic research, jointly with academia, that would enhance United States competitiveness and facilitate industry's commercial adoption of advanced technologies; and

(C) foster the transfer of ~~Advanced~~ Manufacturing technologies by utilizing the regional manufacturing technology transfer program at the National Institute of Standards and Technology and, other ~~federal~~ laboratories.

(2) The Secretary, in carrying out this subsection, may make grants to universities or other research organizations for conducting research and development activities.

Redesignate subsequent subsections, and all references thereto, accordingly.

Mr. VALENTINE. Are there any questions?

Let me say at this point that I will ask Mr. Turner to follow up on this or to make any corrections or additions as he deems appropriate. What we would like to do is accept the amendments, which have been described as—submitted by the Ranking Republican Member of the subcommittee, Mr. Lewis, with prejudice. And as this legislation proceeds to the Public Works Committee, where we will make an effort to have it constituted as part of the surface transportation legislation, we will be in conference and contact with Mr. Lewis and other members on the Republican side to see if the meaning of all these amendments can be accommodated in such a manner that we will not risk the re-referral of the legislation to some other committee in the Congress. We have no motive, I might say, except to work with our colleagues to this end, but we bear your indulgence.

Let me say, as things often happen in this institution, it is planned, with the approval of the chairman of the full committee, to move the legislation from here to the committee on—to hope to put it on the legislation of the full Committee on Public Works, which will be marked up next week in the form of an amendment.

Is that fair and accurate? So if anybody has any questions about that, any concern, any comments, I will be glad to hear from you at this time. As I say, I believe that there is more universal sentiment in favor of this legislation on the subcommittee.

Mr. HENRY. That's correct, Mr. Chairman.

Mr. VALENTINE. Mr. Walker, the Ranking Member of the full committee has joined us. Would you have any comments you would like to make at this time?

Mr. WALKER. No, sir, Mr. Chairman. I do have an amendment that I would like to offer at the appropriate time, but other than that——

Mr. VALENTINE. We are considering amendments at this time. I don't know what the magic words are, but if you want to have an amendment, send it down here to us.

Mr. WALKER. That's fine, Mr. Chairman. I think it's in your packet.

Mr. VALENTINE. It's circulated. We have these amendments pending.

What I undertook to say is that without objection we will accept the amendments which have been presented to us, with prejudice.

Mr. WALKER. Okay. That's fine.

Mr. VALENTINE. With prejudice means that it's up to the individual's interpretation.

Mr. WALKER. Parliamentary inquiry. I'm not certain exactly what that means.

Mr. VALENTINE. Mr. Walker, let me tell you what the situation is, as I understand it. Because of what I perceive to be more or less a universal feeling on the subcommittee as to the merits of this legislation, we are trying to get it in shape so that we can move it through this subcommittee and get it on to the Public Works Committee to have it presented to the surface transportation bill next week in the form of an amendment.

The only question that I know of about the amendments is the question as to whether or not they will cause us problems with

Public Works and/or—that is, that they might not accept our little entry into their domain, or that they might require the referral of the legislation to some other committee.

Mr. WALKER. Just a parliamentary inquiry, Mr. Chairman. If in fact we would run into problems of that kind, is it the intention, then, to report the bill to the full committee and attempt to bring it to the floor as a separate piece of legislation?

Mr. VALENTINE. I think that that would be, as far as I am personally concerned, a meritorious approach.

Mr. WALKER. I would agree with that, Mr. Chairman. Under those circumstances, I certainly agree with the chairman and I thank you for including the Walker amendment in the unanimous consent request.

Mr. HENRY. So we're dealing with all five of them?

Mr. VALENTINE. Yes, without objection. Just so that we're clear about it, we're dealing with all five of the amendments, or six.

Now that takes care of the amendments. So then the question becomes——

Mr. HENRY. Mr. Chairman?

Mr. VALENTINE. Yes?

Mr. HENRY. I understand that there have just been some technical changes here where actually we have eight amendments as they have been redivided. There are no changes in substance. So we have the Ritter amendment, there are no three Henry amendments, one Walker amendment, two Lewis amendments, and one Gilchrest amendment. They are all to the maglev study and they have been agreed to by staff on both sides, just for——

Mr. VALENTINE. Without objection, the statement previously made by the chair is amended to encompass the statement just made by Mr. Henry. The amendments we are talking about are eight in number.

So what is the pleasure of the subcommittee with respect to the pending legislation?

Mr. THORNTON. Mr. Chairman, I have a parliamentary inquiry. I think I understood your explanation, but I noticed that the last of the amendments by Mr. Ritter—which I support—calls for funds to be spent for high speed rail research. I believe that my understanding of jurisdiction of the committees is correct that high speed rail matters are generally handled in the Committee on Energy and Commerce.

Mr. VALENTINE. That is correct.

Mr. THORNTON. And this might be an example of an amendment which, if adopted, might cause this bill to be sequentially referred to Energy and Commerce rather than going directly to Public Works.

My question is, If someone raises that point, does that amendment drop off and the bill go forward without it to Public Works?

Mr. VALENTINE. I would say to the gentleman from Arkansas, it is my understanding that if that point is raised, that we would confer with the members in interest on the other side, who introduced it, and if they would——

Mr. THORNTON. And follow such course as might be agreed upon?

Mr. VALENTINE. Right, as agreed upon, which presumably would be that the amendment would be withdrawn or we would suffer the movement of the bill to the Commerce——

Mr. THORNTON. I thank you for the explanation and——

Mr. VALENTINE. Be advised that that amendment does cause more concern than others.

Mr. THORNTON. Thank you.

Mr. RITTER. If the gentleman would yield——

Mr. VALENTINE. Mr. Ritter.

Mr. RITTER. Thank you, Mr. Chairman.

I certainly do not wish to hold up the bill, and if need be, if it looks like we may run into a jurisdictional problem, then I would be pleased to see a separate bill move on a separate track. The good news about putting it into this bill, we have a vehicle and its moving, and also I frankly am the ranking Republican member on the Energy and Commerce Transportation and Hazmat Subcommittee, which oversees railroads. But they have regulatory oversight. They do not have the ability to fund research. So we're in one of these situations where one way or another we're going to need to cooperate across the two subcommittees and to the full committee.

I yield back to the gentleman.

Mr. THORNTON. Mr. Chairman, I was not reserving a right to object, nor do I wish to object. I like the bill as it is written and I approve personally of the amendments and think the chairman has chosen a good course.

Mr. VALENTINE. Thank you, Mr. Thornton.

Does anybody else have any comments?

Mr. RITTER. Mr. Chairman, I would ask unanimous consent that a statement that I had prepared on behalf of the amendment be included in the record at the appropriate place.

Mr. VALENTINE. Without objection.

Mr. RITTER. Thank you, Mr. Chairman.

Mr. VALENTINE. We will see again. If there are no further comments, if anybody here would care to make a motion as to what disposition the subcommittee should make of this matter, I will be glad to recognize it, since I don't have any script here in front of me.

Mr. HENRY. Mr. Chairman.

Mr. VALENTINE. I recognize Mr. Henry.

Mr. HENRY. Mr. Chairman, I move that the subcommittee report the bill, as amended. Furthermore, I move to instruct the staff to prepare the subcommittee report to make technical and conforming amendments and let the chairman take all necessary steps to bring the bill before the full committee for consideration.

Is that the correct motion?

Mr. VALENTINE. I believe it should be adequate. If not, we will——

Mr. HENRY. Except the fact that it may go straight to Energy and Commerce—not Energy and Commerce.

Mr. VALENTINE. That little place, Public Works.

Mr. THORNTON. Perhaps, Mr. Henry, the last phrase should be that the chairman take such steps as may be appropriate in the circumstances.

Mr. HENRY. To take such steps as may be appropriate in the circumstances.

I thank my colleague.

Mr. VALENTINE. You have heard the motion.

All in favor of the bill, say aye.

[Chorus of ayes.]

Mr. VALENTINE. Opposed, no.

[No response.]

Mr. VALENTINE. Is there anything else to be done?

Does anybody else have anything to say for the good of the aura?

Mr. HENRY. Mr. Chairman, I do.

Mr. VALENTINE. I'm sorry. You're out——[Laughter.]

Mr. HENRY. I used to teach legislative process, and I would sure have a difficult time writing my chapter on some of the nuances as to how the committee system works, based on this meeting. But thank you, Mr. Chairman, for the tremendous cooperation that you and staff of both sides have——

Mr. VALENTINE. Let the record show that all of the language here that has come from the chairman that does not conform to standard parliamentary procedure is intended to move this legislation on its course, as has been defined. And without objection, I authorize the staff to make such changes in it as to the form to Roberts Rules of Order. [Laughter.]

The subcommittee stands——

Mr. RITTER. Mr. Chairman? If the chairman would yield for a moment, I want to thank him for his leadership and just say that this is the kind of thing we need to be doing more of. We need to be focusing our Federal R&D on the underpinnings of America's economy. And certainly when you talk about transportation and the industries aligned with transportation, the infrastructure, the importance to our economy, it's a place that this subcommittee and this full committee should be four-square. I commend the chairman for his efforts.

Mr. VALENTINE. I thank the gentleman

If there are no further words of praise for the Chair——[Laughter.]

[Whereupon, at 1:59 p.m., the subcommittee adjourned, to reconvene at the call of the Chair.]

102D CONGRESS
1ST SESSION

H. R. 2950

[Report No. 102–171, Part I]

To develop a national intermodal surface transportation system, to authorize funds for construction of highways, for highway safety programs, and for mass transit programs, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

JULY 18, 1991

Mr. MINETA (for himself, Mr. ROE, Mr. HAMMERSCHMIDT, and Mr. SHUSTER) introduced the following bill; which was referred to the Committee on Public Works and Transportation

JULY 26, 1991

Additional sponsors: Mr. VISCLOSKY, Mr. KOLTER, Mr. POSHARD, Mr. BORSKI, Mr. DE LUGO, Mr. MCEWEN, and Mr. CLINGER

JULY 26, 1991

Reported with an amendment and referred to the Committee on Ways and Means for a period ending not later than July 31, 1991 for consideration of such provisions of the bill and amendment as fall within the jurisdiction of that committee pursuant to clause 1(v), rule X

[Strike out all after the enacting clause and insert the part printed in italic]

[For text of introduced bill, see copy of bill as introduced on July 18, 1991]

A BILL

To develop a national intermodal surface transportation system, to authorize funds for construction of highways, for highway safety programs, and for mass transit programs, and for other purposes.

TITLE VI—RESEARCH

PART A—PROGRAMS, STUDIES, AND ACTIVITIES

SEC. 601. RESEARCH AND TECHNOLOGY PROGRAM.

(a) IN GENERAL.—Section 307(a) of title 23, United States Code, is amended to read as follows:

"(a) RESEARCH AND TECHNOLOGY PROGRAM.—

"(1) AUTHORITY OF THE SECRETARY.—The Secretary may engage in research, development, and technology transfer activities on motor carrier transportation and all phases of highway planning and development including construction, operation, modernization, development, design, maintenance, safety, financing, and traffic conditions, including the effect of State laws and is authorized to test, develop, or assist in the testing and developing of any material, invention, patented article, or process. The Secretary may carry out the authority granted by this section, either independently, or in cooperation with any other branch of the Government or by making grants to, and entering into contracts and cooperative agreements with the National Academy of Sciences, the American Association of State Highway and Transportation Officials, or any State agency, authority, association, institution, corporation (profit or nonprofit), organization, or person. The Secretary is also

authorized, acting independently or in cooperation with other Federal departments, agencies, or instrumentalities, to make grants for research fellowships for any purpose for which research is authorized by this section.

"(2) COLLABORATIVE RESEARCH AND DEVELOPMENT.—For purposes of encouraging innovative solutions to highway problems and stimulating the marketing of new technology by private industry, the Secretary is authorized to undertake on a cost-shared basis, collaborative research and development with non-Federal entities, including State and local governments, foreign governments, colleges and universities, corporations, institutions, partnerships, sole proprietorships, and trade associations which are incorporated or established under the laws of any State. In carrying out this section, the Secretary may enter into a cooperative research and development agreement, as defined in section 12 of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3710a). The average Federal share in these agreements shall not exceed 50 percent; except that, if there is substantial public interest or benefit, the Secretary may approve a higher Federal level of participation. Cooperative research and development agreements

shall recognize all directly related costs to the non-Federal partners, including personnel, travel, and hardware development. The research, development, or utilization of any technology pursuant to an agreement under this paragraph, including the terms under which technology may be licensed and the resulting royalties may be distributed, shall be subject to provisions of such Act.

"(3) FUNDS.—The funds required to carry out the provisions of this subsection and subsections (b), (d), and (e) shall be taken out of the administrative funds authorized by section 104(a) and funds as may be deposited in a special account with the Secretary of the Treasury for those purposes by any cooperating organization or person. Not less than 15 percent of these funds shall be used for long-term research projects. The term 'long-term research project', as used in this paragraph, means a research project which is unlikely to be completed within 10 years. The provisions of section 3709 of the Revised Statutes (41 U.S.C. 5) shall not be applicable to contracts or agreements made under the authority of this section.".

(b) SURFACE TRANSPORTATION RESEARCH AND DEVELOPMENT PLAN.—

(1) FINDINGS.—The Congress finds that—

(A) despite an annual expenditure in excess of $10,000,000,000 on surface transportation and its infrastructure, the Federal Government has not developed a clear vision of—

(i) how the surface transportation systems of the 21st century will differ from the present;

(ii) how they will interface with each other and with other forms of transportation;

(iii) how such systems will adjust to changing American population patterns and lifestyles; and

(iv) the role of federally funded research and development in ensuring that appropriate transportation systems are developed and implemented;

(B) the population of the United States is projected to increase by over 30,000,000 people within the next 20 years, mostly in existing major metropolitan areas, which will result in increased traffic congestion within and between urban areas, more accidents, loss of productive time, and increased cost of transportation unless new technologies are developed to improve public

transportation within cities, and to move people and goods between cities;

(C) 18,000,000 crashes, 4,000,000 injuries, and 45,000 fatalities each year on the Nation's highways are intolerable, and substantial research is required in order to develop safer technologies in their most useful and economic forms;

(D) current research and development funding for surface transportation is insufficient to provide the United States with the technologies essential to providing its own advanced transportation systems in the future, and as a result the United States is becoming increasingly dependent on foreign surface transportation technologies and equipment to meet its expanding surface transportation needs;

(E) a more active, focused surface transportation research and development program involving cooperation among the Federal Government, United States based industry, and United States universities should be organized on a priority basis;

(F) intelligent vehicle highway systems represent the best near-term technology for improving surface transportation for public benefit by

providing equipment which can improve traffic flow and provide for enhanced safety;

(G) research and development programs related to surface transportation are fragmented and dispersed throughout government, and need to be strengthened and incorporated in an integrated framework within which a consensus on the goals of a national surface transportation research and development program must be developed;

(H) the inability of government agencies to cooperate effectively, the difficulty of obtaining public support for new systems and rights-of-way, and the high cost of capital financing discourage private firms from investing in the development of new transportation equipment and systems; therefore the Federal Government should sponsor and coordinate research and development of new technologies to provide safer, more convenient, and affordable transportation systems for use in the future; and

(I) an effective high technology applied research and development program should be implemented quickly by strengthening the Department of Transportation research and develop-

ment staff and by contracting with private industry for specific development projects.

(2) PLAN.—The Secretary shall develop an integrated national plan (hereafter in this part referred to as the "Plan") for surface transportation research and development, including details of the programs described in this part, with provisions for appropriate funding levels and a schedule with milestones, preliminary cost estimates, appropriate work scopes, personnel requirements, and estimated costs and goals for the next 3 years for each area of research and development. The Plan shall also include a 10-year projection of long-term research and development. Recommendations for the appropriate source or mechanism for surface transportation research and development funding, taking into account the recommendations of the Research and Development Coordinating Council of the Department of Transportation shall also be included. The initial Plan shall be submitted to the Congress by January 15, 1992. The Plan shall be reviewed and updated, with comments and recommendations submitted to the Congress, annually. The Plan shall focus on those surface transportation systems needed for future urban, suburban, and rural areas in the next decade. A primary component of the

Plan shall be cooperation with industry in carrying out this part and to strengthen the manufacturing capabilities of United States firms in order to produce products for surface transportation systems. In any case where a different technology or alternative program can accomplish the same or better results than those described in this part, the Secretary may make recommendations for the alternative, and shall promptly report such recommendations to the Congress.

(3) CONFORMANCE WITH PLAN.—All surface transportation research and development within the Department of Transportation shall be included in the Plan and shall be evaluated in accordance with the Plan.

(4) OBJECTIVES OF PLAN.—The Plan shall provide for the development of a range of technologies, within the shortest time possible, needed to produce convenient, safe, affordable, modes of surface transportation to be available for public use beginning in the mid 1990's, and for maintaining a long-term advanced research and development program to provide for next generation surface transportation systems.

(5) COORDINATION.—In developing the Plan and in carrying out this part, the Secretary shall consult

with and, where appropriate, use the expertise of other Federal agencies and their laboratories.

(c) SHORT HAUL PASSENGER TRANSPORTATION SYSTEMS.—The Secretary shall conduct necessary systems research in order to develop a concept for a lightweight, rubber-tired multiple-unit system powered by deep discharge batteries in conjunction with recharging stations beneath paved roadways at strategic locations. The Secretary shall create a potential systems concept and, as part of the Plan, shall make recommendations to the Congress by July 1, 1992.

(d) SUPPORTING INFRASTRUCTURE.—The Secretary shall strengthen and expand surface transportation infrastructure research and development. The expanded program shall include the following elements:

(1) Methods and materials for improving the durability, thereby extending the life of bridge structures, including new and innovative technologies to reduce corrosion.

(2) Expansion of the Department of Transportation's inspection and mobile nondestructive examination capabilities, including consideration of the use of high energy field radiography for more thorough and more frequent inspections of bridge structures as well as added support to State highway departments.

(3) The development of a concept for robotic highway and road repair machinery consisting of a highly mobile unit with the capability for removing bituminous paving and concrete and replacing the damaged material using nonlabor intensive technologies and which would result in a durable, smooth, and level surface.

(4) The Secretary shall conduct a research and development program on new materials which are compatible with technologies developed under paragraph (3) and will set rapidly, support heavy wheel loadings, and retain structural integrity through repeated loading cycles over a minimum of 10 years of high volume use.

(5) The Secretary shall determine whether to initiate a construction equipment research and development program directed toward the reduction of costs associated with the construction of highway and mass transit systems. The results of the inquiry shall be submitted to the Congress by July 1, 1992.

(6) The Secretary shall undertake or supervise surface transportation infrastructure research to develop—

(A) nondestructive evaluation equipment for use with existing structures and for the "next

generation" structures that utilize advanced materials;

(B) information technologies, including—

(i) appropriate computer programs to collect and analyze data on the status of the existing infrastructure facilities for enhancing management, for growth, and for capacity; and

(ii) dynamic simulation models of surface transportation systems for predicting capacity, safety, and infrastructure durability problems, for evaluating planned research projects, and for testing the strengths and weaknesses of proposed revisions in surface transportation operations programs; and

(C) new and innovative technologies to enhance and facilitate field construction and rehabilitation techniques for minimizing disruption during repair and maintenance of existing structures.

(e) STRATEGIC HIGHWAY RESEARCH PROGRAM.—

(1) IMPLEMENTATION OF RESULTS.—Section 307(b) of such title is amended—

(A) by inserting "MANDATORY CONTENTS OF RESEARCH PROGRAM.—" after "(b)";

(B) by inserting "(1) INCLUSION OF CERTAIN STUDIES.—" before "The Secretary"; and

(C) by adding at the end the following new paragraph:

"(2) IMPLEMENTATION OF SHRP RESULTS.—The highway research program under subsection (a) shall include a program to implement results of the strategic highway research program carried out under subsection (d) (including results relating to automatic intrusion alarms for street and highway construction work zones) and to continue the long-term pavement performance tests being carried out under such program. Of amounts deducted under section 104(a) for each of fiscal years 1992, 1993, 1994, 1995, and 1996, the Secretary shall expend not less than $12,000,000 in fiscal year 1992, $16,000,000 in fiscal year 1993, and $20,000,000 per fiscal year for fiscal years 1994, 1995, and 1996 to carry out this paragraph.".

(2) CONFORMING AMENDMENT.—Subsection (b) of section 307 of such title is further amended by indenting paragraph (1) of such subsection, as designated by paragraph (1)(B) of this subsection, and aligning such paragraph (1) with paragraph (2) of such

subsection, as added by paragraph (1)(C) of this subsection.

(f) STATE AUTHORITY TO PROGRAM FUNDS.—Section 307(c) is amended to read as follows:

"(c) STATE PLANNING AND RESEARCH.—

*"(1) GENERAL RULE.—One and ½ percent of the sums apportioned for each fiscal year beginning with fiscal year 1992 to any State under sections 104 and 144 of this title and for highway projects under section 103(e)(4) shall be available for expenditure by the State highway department in consultation with the Secretary only for engineering and economic surveys and investigations; for the planning of future highway programs and local public transportation systems and for planning for the financing thereof, including statewide planning under section 135 of this title; for development and implementation of management systems under section 303 of this title; for studies of the economy, safety, and convenience of highway usage and the desirable regulation and equitable taxation thereof; and for research, development, and technology transfer activities necessary in connection with the planning, design, construction, and maintenance of highway, public transportation, and intermodal systems and for study, research, and

training on engineering standards and construction materials, including evaluation and accreditation of inspection and testing, and the regulation and taxation of their use. Not less than 25 percent of the sums made available to a State in a fiscal year under this paragraph shall be expended by the State for research, development, and technology transfer activities described in this paragraph relating to highway, public transportation, and intermodal systems.

"(2) STATE MATCH.—Sums made available under paragraph (1) shall be matched by the State in accordance with section 120 of this title unless the Secretary determines that the interests of the Federal-aid highway program would be best served without such matching.

"(3) ADMINISTRATION OF SUMS.—Sums made available under paragraph (1) shall be combined and administered by the Secretary as a single fund which shall be available for obligation for the same period as funds apportioned under section 104(b)(1) of this title.".

(g) EFFECTIVE DATE.—The amendments made by this section shall take effect October 1, 1991.

SEC. 602. NATIONAL HIGHWAY INSTITUTE.

Section 321 of title 23, United States Code, is amended to read as follows:

"§321. National Highway Institute

"(a) ESTABLISHMENT AND AUTHORITY TO CONDUCT TRAINING.—The Secretary shall establish and operate in the Federal Highway Administration a National Highway Institute (hereinafter in this section referred to as the 'Institute'). The Institute shall develop and administer, in cooperation with the State transportation or highway departments, and any national or international entity, training programs of instruction for Federal Highway Administration, State and local transportation and highway department employees, State and local police, public safety and motor vehicle employees, and United States citizens and foreign nationals engaged or to be engaged in highway work of interest to the United States. Programs may include courses in modern developments, techniques, management, and procedures relating to highway planning, environmental factors, acquisition of rights-of-way, relocation assistance, engineering, safety, construction, maintenance, contract administration, motor carrier activities, and inspection. The Secretary shall administer through the Institute the authority vested in the Secretary by this title or by any other provision of law for the development and conduct of education and training programs relating to highways.

"(b) SET-ASIDE.—Not to exceed ¼ of 1 percent of funds apportioned under section 104(b)(1) to a State shall be available for expenditure by the State highway department for payment of not to exceed 80 percent of the cost of tuition and direct educational expenses (but not travel, subsistence, or salaries) in connection with the education and training of State and local highway department employees as provided in this section.

"(c) FEDERAL RESPONSIBILITY.—Education and training of Federal, State and local highway employees authorized by this section shall be provided—

"(1) by the Secretary at no cost to the States and local governments for those subject areas which are a Federal program responsibility; or

"(2) in any case where education and training are to be paid for under (b) by the State, subject to the approval of the Secretary, through grants and contracts with public and private agencies, institutions, individuals, and the Institute; except that private agencies and individuals shall pay the full cost of any education and training received by them.

"(d) TRAINING FELLOWSHIPS; COOPERATION; COLLECTION OF FEES.—The Institute is authorized, subject to approval of the Secretary, to engage in all phases of contract authority for training purposes authorized by this sec-

tion, including the granting of training fellowships. The Institute is also authorized to carry out its authority independently or in cooperation with any other branch of the Government, State agency, authority, association, institution, corporation (profit or nonprofit), any other national or international entity, or any other person. The Institute is authorized to establish and collect fees from any entity and place them in a special account for the purpose of this section.

"(e) FUNDS.—The funds required to carry out this section may be from the sums deducted for administration purposes under section 104(a). The provisions of section 3709 of the Revised Statutes (41 U.S.C. 5) shall not be applicable to contracts or agreements made under the authority of this section. The sums provided pursuant to this subsection may be combined or held separate from the fees or memberships collected and be administered by the Secretary as a fund which shall be available until expended.".

SEC. 603. EDUCATION AND TRAINING PROGRAM.

Chapter 3 of title 23, United States Code, is amended by adding at the end the following new section:

"§325. Education and training program

"(a) AUTHORITY.—The Secretary is authorized to carry out a transportation assistance program that will provide highway and transportation agencies, in urbanized

areas of 50,000 to 1,000,000 population and in rural areas, access to modern highway technology.

"(b) GRANTS AND CONTRACTS.—The Secretary may make grants and enter into direct contracts for education and training, technical assistance, and related support services that will—

"(1) assist rural local transportation agencies to develop and expand their expertise in road and transportation areas, improve roads and bridges, enhance programs for the movement of passengers and freight, and deal effectively with specific road related problems by preparing and providing training packages, manuals, guidelines, and technical resource materials;

"(2) identify, package, and deliver usable highway technology to local jurisdictions to assist urban transportation agencies in developing and expanding their ability to deal effectively with road related problems; and

"(3) establish, in cooperation with State transportation or highway departments and universities, local technical assistance program centers to deliver technology and technology assistance to—

"(A) local rural transportation agencies, and

"(B) urban transportation agencies in States with 2 or more urbanized areas of 50,000 to 1,000,000 population.

The Secretary shall provide technical and financial support for the centers.".

SEC. 604. INTERNATIONAL TRANSPORTATION OUTREACH PROGRAM.

(a) IN GENERAL.—Chapter 3 of title 23, United States Code, is further amended by adding at the end the following new section:

"§326. International transportation outreach program

"(a) ACTIVITIES.—The Secretary shall engage in activities to inform the domestic highway, transit, and intermodal transportation communities of technological innovations developed outside the United States that could significantly improve transportation in the United States, to promote United States transportation expertise internationally, and to increase transfers of United States transportation technology to foreign countries. Such activities may include—

"(1) develop, monitor, assess, and domestically disseminate information about foreign transportation innovations that could significantly improve transportation in the United States;

"(2) research, development, demonstration, training, and other forms of technology transfer and exchange;

"(3) inform other countries about the technical quality of American transportation goods and services through participation in trade shows, seminars, expositions, and other such activities;

"(4) offer, subject to recovery of Federal costs, those Department of Transportation technical services which cannot be readily obtained from the United States private sector to be incorporated into the proposals of United States firms undertaking foreign transportation projects; and

"(5) conduct studies to assess the need for or feasibility of transportation improvements in countries that are not members of the Organization for Economic Cooperation and Development as of the date of the enactment of this section and in Greece and Turkey.

"(b) COOPERATION.—The Secretary may carry out the authority granted by this section, either independently, or in cooperation with any other branch of the United States Government, State or local agency, authority, association, institution, corporation (profit or nonprofit), foreign gov-

ernment, multinational institution, or any other organization or person.

"(c) FUNDS.—The funds available to carry out the provisions of this section shall include funds deposited in a special account with the Secretary of the Treasury for such purposes by any cooperating organization or person. The funds shall be available for promotional materials, travel, reception, and representation expenses necessary to carry out the activities authorized by this section. Reimbursements for services provided under this section shall be credited to the appropriation concerned.".

(b) CONFORMING AMENDMENT.—The analysis for chapter 3 of such title is amended by adding at the end thereof the following new items:

"325. Education and training program.
"326. International transportation outreach program.".

SEC. 605. APPLIED RESEARCH AND TECHNOLOGY PROGRAM; SEISMIC RESEARCH PROGRAM.

Section 307 of title 23, United States Code, is amended by redesignating subsections (e) and (f) as subsections (g) and (h), respectively, and by inserting after subsection (d) the following new subsections:

"(e) APPLIED RESEARCH AND TECHNOLOGY PROGRAM.—

"(1) ESTABLISHMENT.—The Secretary shall establish and implement in accordance with this subsection an applied research and technology program for

the purpose of accelerating testing, evaluation, and implementation of technologies which are designed to improve the durability, efficiency, environmental impact, productivity, and safety of highway, transit, and intermodal transportation systems.

"(2) GUIDELINES.—Not later than 18 months after the date of the enactment of this subsection, the Secretary shall issue guidelines to carry out this subsection. Such guidelines shall include:

"(A) TECHNOLOGIES.—Guidelines on the selection of both foreign and domestic technologies to be tested.

"(B) TEST LOCATIONS.—Guidelines on the selection of locations at which tests will be conducted. Such guidelines shall ensure that testing is conducted in a range of climatic, traffic, geographic, and environmental conditions, as appropriate for the technology being tested.

"(C) DATA.—Guidelines for the scientific collection and evaluation of appropriate test data.

"(3) TECHNOLOGIES.—Technologies which may be tested under this subsection include, but are not limited to—

"(A) accelerated construction materials and procedures;

"(B) environmentally beneficial materials and procedures;

"(C) materials and techniques which provide enhanced serviceability and longevity under adverse climactic, environmental, and load effects;

"(D) technologies which increase the efficiency and productivity of vehicular travel; and

"(E) technologies and techniques which enhance the safety and accessibility of vehicular transportation systems.

"(4) HEATED BRIDGE TECHNOLOGIES.—

"(A) PROJECTS.—As part of the program under this subsection, the Secretary shall carry out projects to assess the state of technology with respect to heating the decks of bridges and the feasibility of, and costs and benefits associated with, heating the decks of bridges. Such projects shall be carried out by installing heating equipment on the decks of bridges which are being replaced or rehabilitated under section 144 of this title.

"(B) MINIMUM NUMBER OF BRIDGES.—The number of bridges for which heating equipment is installed under this subsection in a fiscal year shall not be less than 10 bridges.

"(5) ELASTOMER MODIFIED ASPHALT.—As part of the program under this subsection, the Secretary shall carry out a project in the State of New Jersey to demonstrate the environmental and safety benefits of elastomer modified asphalt.

"(6) ALL WEATHER PAVEMENT MARKINGS.—As part of the program under this subsection, the Secretary shall carry out a program to demonstrate the safety and durability of all weather pavement markings.

"(7) TESTING OF HIGHWAY TECHNOLOGIES.—Projects carried out under this subsection to test technologies related to highways shall be carried out on highways on the Federal-aid system.

"(8) TECHNICAL ASSISTANCE.—The Secretary shall provide technical assistance to States and localities in carrying out projects under this subsection.

"(9) ANNUAL REPORT.—Not later than 1 year after the date of the enactment of this subsection, and annually thereafter, the Secretary shall transmit to the Committee on Public Works and Transportation

of the House of Representatives and the Committee on Environment and Public Works of the Senate a report on the progress and research findings of the program carried out under this subsection.

"(10) FEDERAL SHARE.—The Federal share of the cost of a project carried out under this subsection shall not exceed 80 percent.

"(11) FUNDING.—The Secretary shall expend from administrative and research funds deducted under section 104(a) of this title and funds made available under section 21(h) of the Urban Mass Transportation Act of 1964 $50,000,000 per fiscal year for each of fiscal years 1992, 1993, 1994, 1995, and 1996 to carry out this subsection. Of such amount, in each of such fiscal years, the Secretary shall expend not less than $5,000,000 per fiscal year to carry out projects related to heated bridge technologies under paragraph (4) and not less than $2,000,000 per fiscal year to carry out projects related to all weather pavement markings. Amounts made available under this subsection shall remain available until expended and shall not be subject to any obligation limitation.

"(f) SEISMIC RESEARCH PROGRAM.—

"(1) ESTABLISHMENT.—The Secretary shall establish a program to study the vulnerability of highways, tunnels, and bridges on the Federal-aid system to earthquakes and develop and implement cost-effective methods of retrofitting such highways, tunnels, and bridges to reduce such vulnerability.

"(2) COOPERATION.—The Secretary shall conduct the program under this section in cooperation with the National Center for Earthquake Engineering Research at the University of Buffalo.

"(3) FUNDING.—Of amounts deducted under section 104(a) for each of fiscal years 1992, 1993, 1994, 1995, and 1996, the Secretary shall expend not more than $4,000,000 in each of such fiscal years to carry out this subsection.

"(4) REPORT.—Not later than 2 years after the date of the enactment of this section, the Secretary shall transmit to the Committee on Public Works and Transportation of the House of Representatives and the Committee on Environment and Public Works of the Senate a report on the progress and research findings of the program carried out under this section.".

SEC. 606. UNIVERSITY TRANSPORTATION CENTERS.

(a) ADDITIONAL RESPONSIBILITY.—Section 11(b)(2) of the Urban Mass Transportation Act of 1964 (49 U.S.C.

App. 1607c(b)(2)) is amended by inserting "transportation safety and" after "training concerning".

(b) ESTABLISHMENT OF NEW CENTERS; PROGRAM COORDINATION.—Section 11(b) of such Act (49 U.S.C. App. 1607c(b)) is amended by striking paragraphs (7) and (8), by redesignating paragraphs (9) and (10) as paragraphs (11) and (12), respectively, and by inserting after paragraph (6) the following new paragraphs:

"(7) NATIONAL CENTER.—To accelerate the involvement and participation of minority individuals and women in transportation-related professions, particularly in the science, technology, and engineering disciplines, the Secretary shall make grants under this section to Morgan State University to establish a national center for transportation management, research, and development. Such center shall give special attention to the design, development, and implementation of research, training, and technology transfer activities to increase the number of highly skilled minority individuals and women entering the transportation workforce.

"(8) CENTER FOR TRANSPORTATION AND INDUSTRIAL PRODUCTIVITY.—The Secretary shall make grants under this section to the New Jersey Institute of Technology to establish and operate a

center for transportation and industrial productivity. Such center shall conduct research and development activities which focus on methods to increase surface transportation capacity, reduce congestion, and reduce costs for transportation system users and providers through the use of transportation management systems.

"(9) NATIONAL RURAL TRANSPORTATION STUDY CENTER.—The Secretary shall make grants under this section to the University of Arkansas to establish a national rural transportation center. Such center shall conduct research, training, and technology transfer activities in the development, management, and operation of intermodal transportation systems in rural areas.

"(10) PROGRAM COORDINATION.—

"(A) IN GENERAL.—The Secretary shall provide for the coordination of research, education, training, and technology transfer activities carried out by grant recipients under this subsection, the dissemination of the results of such research, and the establishment and operation of a clearinghouse between such centers and the transportation industry. The Secretary shall re-

view and evaluate programs carried out by such grant recipients at least annually.

"(B) FUNDING.—Not to exceed 1 percent of the funds made available from Federal sources to carry out this subsection may be used by the Secretary to carry out this paragraph.".

SEC. 607. UNIVERSITY RESEARCH INSTITUTES.

Section 11 of the Urban Mass Transportation Act of 1964 (49 U.S.C. App. 1607c) is amended by adding at the end the following new subsection:

"(c) UNIVERSITY RESEARCH INSTITUTES.—

"(1) INSTITUTE FOR NATIONAL SURFACE TRANSPORTATION POLICY STUDIES.—The Secretary shall make grants under this section to San Jose State University to establish and operate an institute for national surface transportation policy studies. Such institute shall—

"(A) include both male and female students of diverse socioeconomic and ethnic backgrounds who are seeking careers in the development and operations of surface transportation programs; and

"(B) conduct research and development activities to analyze ways of improving aspects of

the development and operation of the Nation's surface transportation programs.

"(2) INFRASTRUCTURE TECHNOLOGY INSTITUTE.—The Secretary shall make grants under this section to Northwestern University to establish and operate an institute for the study of techniques to evaluate and monitor infrastructure conditions, improve information systems for infrastructure construction and management, and study advanced materials and automated processes for construction and rehabilitation of public works facilities.

"(3) FUNDING.—There is authorized to be appropriated out of the Highway Trust Fund, other than the Mass Transit Account, for each of fiscal years 1992, 1993, 1994, 1995, and 1996 $250,000 per fiscal year to carry out paragraph (1) and $3,000,000 per fiscal year to carry out paragraph (2).".

SEC. 608. NATIONAL COUNCIL ON SURFACE TRANSPORTATION RESEARCH.

(a) ESTABLISHMENT.—There is established a National Council on Surface Transportation Research.

(b) FUNCTION.—The Council shall make a complete investigation and study of current surface transportation research and technology developments in the United

States and internationally. The Council shall identify gaps and duplication in current surface transportation research efforts, determine research and development areas which may increase efficiency, productivity, safety, and durability in the Nation's surface transportation systems, and develop a national surface transportation research and development plan for immediate implementation.

(c) SPECIFIC MATTERS TO BE ADDRESSED.—The Council shall—

(1) survey current surface transportation public and private research efforts in the United States and internationally;

(2) examine factors which lead to fragmentation of surface transportation research efforts and determine how increased coordination in such efforts may be achieved;

(3) compare the role of the Federal Government with the role of foreign governments in promoting transportation research and evaluate the appropriateness of United States policy on government-sponsored research;

(4) identify barriers to innovation in surface transportation systems;

(5) examine the range of funding arrangements available for surface transportation research and de-

velopment and the level of resources currently available for such purposes; and

(6) identify surface transportation research areas and opportunities, including opportunities for international cooperation, offering potential benefit to the Nation's surface transportation system, assess their relative priority, and develop a plan for national surface transportation research and development which includes short- and long-range objectives.

(d) MEMBERSHIP.—

(1) APPOINTMENT.—The Council shall be composed of 7 members as follows:

(A) Three members appointed by the President.

(B) One member appointed by the Speaker of the House of Representatives.

(C) One member appointed by the minority leader of the House of Representatives.

(D) One member appointed by the majority leader of the Senate.

(E) One member appointed by the minority leader of the Senate.

(2) QUALIFICATIONS.—

(A) IN GENERAL.—Members appointed pursuant to paragraph (1) shall be appointed from

among individuals involved in surface transportation research, including representatives of Federal, State, and local governments, other public agencies, colleges and universities, public, private, and nonprofit research organizations, and organizations representing transportation providers, shippers, labor, and the financial community.

(B) INTERNATIONAL ADVISOR.—One of the members appointed by the President pursuant to paragraph (1)(A) shall serve as an international research advisor for the Council.

(3) TERMS.—Members shall be appointed for the life of the Council.

(4) VACANCIES.—A vacancy in the Council shall be filled in the manner in which the original appointment was made.

(5) TRAVEL EXPENSES.—Members shall serve without pay but shall receive travel expenses, including per diem in lieu of subsistence, in accordance with sections 5702 and 5703 of title 5, United States Code.

(6) CHAIRMAN.—The Chairman of the Council shall be elected by the members.

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(e) STAFF.—The Council may appoint and fix the pay of such personnel as it considers appropriate.

(f) STAFF OF FEDERAL AGENCIES.—Upon request of the Council, the head of any department or agency of the United States may detail, on a reimbursable basis, any of the personnel of that department or agency to the Council to assist it in carrying out its duties under this section.

(g) ADMINISTRATIVE SUPPORT SERVICES.—Upon the request of the Council, the Administrator of General Services shall provide to the Council, on a reimbursable basis, the administrative support services necessary for the Council to carry out its responsibilities under this section.

(h) OBTAINING OFFICIAL DATA.—The Council may secure directly from any department or agency of the United States information necessary for it to carry out its duties under this section. Upon request of the Council, the head of that department or agency shall furnish that information to the Council.

(i) COORDINATION.—The Council shall carry out its duties under this section in coordination with the National Commission on Intermodal Transportation.

(j) REPORT.—Not later than September 30, 1993, the Council shall transmit to Congress a final report on the results of the investigation and study conducted under this section. The report shall include recommendations of the

Council, including a proposed national surface transportation research agenda for immediate implementation.

(k) TERMINATION.—The Council shall terminate on the 180th day following the date of transmittal of the report under subsection (j). All records and papers of the Council shall thereupon be delivered to the Administrator of General Services for deposit in the National Archives.

SEC. 609. RESEARCH ADVISORY COMMITTEE.

(a) ESTABLISHMENT.—Not later than 180 days after the transmittal of the report to Congress under section 608, the Secretary shall establish an independent surface transportation research advisory committee.

(b) PURPOSES.—The advisory committee shall provide ongoing advice and recommendations to the Secretary regarding needs, objectives, plans, approaches, content, and accomplishments with respect to short-term and long-term surface transportation research and development. The advisory committee shall also assist in ensuring that such research and development is coordinated with similar research and development being conducted outside of the Department of Transportation.

(c) MEMBERSHIP.—The advisory committee shall be composed of not less than 20 and not more than 30 members appointed by the Secretary from among persons who are not employees of the Department of Transportation and

who are specially qualified to serve on the committee by virtue of their education, training, or experience. A majority of the members of the advisory committee shall be individuals with experience in conducting surface transportation research and development. The Secretary in appointing the members of the advisory committee shall ensure that universities, corporations, associations, consumers, and other Federal and State Government agencies are represented on an equitable basis.

(d) CHAIRMAN.—The Chairman of the advisory committee shall be designated by the Secretary.

(e) PAY AND EXPENSES.—Members of the advisory committee shall serve without pay, except that the Secretary may allow any member, while engaged in the business of the advisory committee or a subordinate committee, travel expenses, including per diem in lieu of subsistence, in accordance with sections 5702 and 5703 of title 5, United States Code.

(f) SUBORDINATE COMMITTEES.—The Secretary shall establish a subordinate committee to the advisory committee to provide advice on advanced highway vehicle technology research and development, and may establish other subordinate committees to provide advice on specific areas of surface transportation research and development. Such subor-

dinate committees shall be subject to subsections (e), (g), and (i) of this section.

(g) ASSISTANCE OF SECRETARY.—Upon request of the advisory committee, the Secretary shall provide such information, administrative services, support staff, and supplies as the Secretary determines are necessary for the advisory committee to carry out its functions.

(h) REPORTS.—The advisory committee shall, within one year after the date of establishment of the advisory committee, and annually thereafter, submit to the Congress a report summarizing its activities under this section.

(i) TERMINATION.—Section 14 of the Federal Advisory Committee Act shall not apply to the advisory committee established under this section.

SEC. 610. DOT DATA NEEDS.

(a) STUDY.—Not later than 1 year after the date of the enactment of this Act, the Secretary shall enter into an agreement with the National Academy of Sciences to conduct a study on the adequacy of data collection procedures and capabilities of the Department of Transportation.

(b) CONTENTS.—The study under this section shall include an evaluation of the Department of Transportation's data collection resources, needs, and requirements and an assessment and evaluation of the systems, capabilities, and

procedures established by the Department to meet such needs and requirements, including the following:

(1) Data collection procedures and capabilities.

(2) Data analysis procedures and capabilities.

(3) Ability of data bases to integrate with one another.

(4) Computer hardware and software capabilities.

(5) Management information systems, including the ability of management information systems to integrate with one another.

(6) Personnel of the Department.

(7) Budgetary needs and resources of the Department for data collection, including an assessment of the adequacy of the budgetary resources provided to the Department and budgetary resources used by the Department for data collection needs and purposes.

(c) REPORT.—Not later than 18 months after the date of the agreement under subsection (a), the National Academy of Sciences shall transmit to the Secretary, the Committee on Environment and Public Works of the Senate, and the Committee on Public Works and Transportation of the House of Representatives a report on the results of the study under this section, including recommendations for improving the Department of Transportation's data collection sys-

tems, capabilities, procedures, and analytical hardware and software and for improving the Department's management information systems.

SEC. 611. STATE LEVEL OF EFFORT.

(a) STUDY.—Not later than 6 months after the date of the enactment of this Act, the Secretary shall begin a comprehensive study of the most appropriate and accurate methods of calculating State level of effort in funding surface transportation programs.

(b) CONTENTS.—The study under this section shall include collection of data relating to State and local revenues collected and spent on surface transportation programs. Such revenues include income from fuel taxes, toll revenues (including bridge and ferry tolls), sales taxes, general fund appropriations, property taxes, bonds, administrative fees, taxes on commercial vehicles, and other appropriate State and local revenue sources.

(c) REPORT.—Not later than 12 months after the date of enactment of this Act, the Secretary shall transmit to the Committee on Environment and Public Works of the Senate and the Committee on Public Works and Transportation of the House of Representatives a report on the results of the study under this section, including recommendations on the most appropriate measure of State level of effort in funding surface transportation programs and com-

prehensive data, by State, on revenue sources and amounts collected by States and local governments and devoted to surface transportation programs.

SEC. 612. EVALUATION OF STATE PROCUREMENT PRACTICES.

(a) STUDY.—The Secretary shall conduct a study to evaluate whether or not current procurement practices of State departments and agencies, including statistical acceptance procedures, are adequate to ensure that highway and transit systems are designed, constructed, and maintained so as to achieve a high quality for such systems at the lowest overall cost.

(b) REPORT.—Not later than 2 years after the date of the enactment of this Act, the Secretary shall transmit to the Committee on Public Works and Transportation of the House of Representatives and the Committee on Environment and Public Works of the Senate a report on the results of the study conducted under this section, together with an assessment of the need for establishing a national policy on transportation quality assurance and recommendations for appropriate legislative and administrative actions.

SEC. 613. HIGHWAY CONSTRUCTION WORK ZONES.

(a) STUDY.—The Secretary shall conduct a study of occupational injury and fatality statistics for street and highway construction workers.

(b) REPORT.—Not later than 2 years after the date of the enactment of this Act, the Secretary shall transmit to the Committee on Public Works and Transportation of the House of Representatives and the Committee on Environment and Public Works of the Senate a report on the results of the study conducted under this section, together with appropriate recommendations for revisions to the Department of Transportation's manual for uniform traffic control devices.

SEC. 614. BUS TESTING.

(a) DEFINITION OF NEW BUS MODEL.—Section 12(h) of the Urban Mass Transportation Act of 1964 (49 U.S.C. 1608(h)) is amended by inserting "(including any model using alternative fuels)" after "means a bus model".

(b) DUTIES OF BUS TESTING FACILITY.—Section 317(b)(1) of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (49 U.S.C. App. 1608 note) is amended—

(1) by inserting "(including braking performance)" after "performance"; and

(2) by inserting "emissions," after "fuel economy,".

(c) FUNDING.—The first sentence of section 317(b)(5) of the Surface Transportation and Uniform Relocation Assistance Act of 1987 is amended by inserting before the period at the end the following: ", for expansion of such facility $1,500,000 for fiscal year 1992, and for establishment of a revolving fund under paragraph (6) $2,500,000 for fiscal year 1992".

(d) REVOLVING LOAN FUND.—Section 317(b) of the Surface Transportation and Uniform Relocation Assistance Act of 1987 is amended by adding at the end the following new paragraph:

"(6) REVOLVING LOAN FUND.—The Secretary shall establish a bus testing revolving loan fund with amounts authorized for such purpose under paragraph (5). The Secretary shall make available as repayable advances amounts from the fund to the person described in paragraph (3) for operating and maintaining the facility.".

SEC. 615. NATIONAL TRANSIT INSTITUTE.

The Urban Mass Transportation Act of 1964 (49 U.S.C. App. 1601-1621) is further amended by adding at the end the following new section:

"SEC. 28. NATIONAL TRANSIT INSTITUTE.

"(a) ESTABLISHMENT.—The Secretary shall make grants to Rutgers University to establish a national tran-

sit institute. The institute shall develop and administer, in cooperation with the Federal Transit Administration, State transportation departments, and public transit agencies, training programs of instruction for Federal, State, and local transportation employees engaged or to be engaged in Federal-aid transit work. Such programs may include courses in recent developments, techniques, and procedures relating to transit planning, management, environmental factors, acquisition and joint use of rights-of-way, engineering, procurement strategies for transit systems, turn-key approaches to implementing transit systems, new technologies, emission reduction technologies, means of making transit accessible to individuals with disabilities, construction, maintenance, contract administration, and inspection. The Secretary shall delegate to the institute the authority vested in the Secretary for the development and conduct of educational and training programs relating to transit.

"(b) FUNDING.—Not to exceed one-half of 1 percent of all funds made available for a fiscal year beginning after September 30, 1991, to a State or public transit agency in the State for carrying out sections 3 and 9 of the Urban Mass Transportation Act of 1964 shall be available for expenditure by the State and public transit agencies in the State, subject to approval by the Secretary, for pay-

ment of not to exceed 80 percent of the cost of tuition and direct educational expenses in connection with the education and training of State and local transportation department employees as provided in this section.

"(c) PROVISION OF TRAINING.—Education and training of Federal, State, and local transportation employees authorized by this section shall be provided—

"(1) by the Secretary at no cost to the States and local governments for those subject areas which are a Federal program responsibility; or

"(2) in any case where such education and training are to be paid for under subsection (b) of this section, by the State, subject to the approval of the Secretary, through grants and contracts with public and private agencies, other institutions, individuals, and the institute.

"(d) FUNDING.—The Secretary shall make available from amounts provided under section 21(h) $3,000,000 per fiscal year for each of fiscal years 1992, 1993, 1994, 1995, and 1996 for carrying out this section.".

SEC. 616. RESEARCH AND DEVELOPMENT AUTHORITY OF SECRETARY OF TRANSPORTATION.

Section 301(6) of title 49, United States Code, as redesignated by section 502(a) of this Act, is amended by

inserting ", and including basic highway vehicle science" after "to aircraft noise".

SEC. 617. PURPOSES OF DEPARTMENT OF TRANSPORTATION.

Section 101(b)(4) of title 49, United States Code, is amended by inserting ", through research and development or otherwise" after "advances in transportation".

SEC. 618. ADVANCED AUTOMOTIVE CONFERENCE AND AWARD.

The Stevenson-Wydler Technology Innovation Act of 1980 is amended by inserting after section 17 the following new sections, and by redesignating subsequent sections and all references thereto accordingly:

"SEC. 18. CONFERENCE ON ADVANCED AUTOMOTIVE TECHNOLOGIES.

"Not later than 180 days after the date of the enactment of this section, the Secretary, through the Under Secretary of Commerce for Technology, in consultation with other appropriate officials, shall convene a conference of domestic motor vehicle manufacturers, parts suppliers, Federal laboratories, and motor vehicle users to explore ways in which cooperatively they can improve the competitiveness of the United States motor vehicle industry by developing new technologies which will enhance the safety and energy savings, and lessen the environmental impact,

of domestic motor vehicles, and the results of such conference shall be published and then submitted to the President and to the Committees on Science, Space, and Technology and Public Works and Transportation of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate.

"SEC. 19. ADVANCED MOTOR VEHICLE RESEARCH AWARD.

"(a) ESTABLISHMENT.—There is established a National Award for the Advancement of Motor Vehicle Research. The award shall consist of a medal, and a cash prize if funding is available for the prize under subsection (c). The medal shall be of such design and materials and bear inscriptions as is determined by the Secretary of Transportation.

"(b) MAKING AND PRESENTING AWARD.—The Secretary of Transportation shall periodically make and present the award to domestic motor vehicle manufacturers, suppliers, or Federal laboratory personnel who, in the opinion of the Secretary of Transportation, have substantially improved the domestic motor vehicle in safety, energy savings, or environmental impact. No person may receive the award more than once every 5 years.

"(c) FUNDING FOR AWARD.—The Secretary of Transportation may seek and accept gifts of money from private sources for the purpose of making cash prize

awards under this section. Such money may be used only for that purpose, and only such money may be used for that purpose.".

SEC. 619. NONAPPLICABILITY TO RAIL.

This title and the amendments made by this title do not apply to transportation by rail.

PART B—INTELLIGENT VEHICLE-HIGHWAY SYSTEMS ACT

SEC. 651. SHORT TITLE.

This part may be cited as the "Intelligent Vehicle-Highway Systems Act of 1991".

SEC. 652. ESTABLISHMENT AND SCOPE OF PROGRAM.

(a) ESTABLISHMENT.—Subject to the provisions of this part, the Secretary shall conduct a program to research, develop, and operationally test intelligent vehicle-highway systems and promote implementation of such systems as a component of the Nation's surface transportation systems.

(b) GOALS.—The goals of the program to be carried out under this part shall include, but not be limited to—

(1) the widespread implementation of intelligent vehicle-highway systems to enhance the capacity, efficiency, and safety of the Federal-aid highway system and to serve as an alternative to additional physical capacity of the Federal-aid highway system;

(2) the enhancement, through more efficient use of the Federal-aid highway system, of the efforts of the several States to attain air quality goals established pursuant to the Clean Air Act;

(3) the enhancement of safe and efficient operation of the Nation's highway systems;

(4) the development and promotion of intelligent vehicle-highway systems and an intelligent vehicle-highway systems industry in the United States;

(5) the reduction of societal, economic, and environmental costs associated with traffic congestion; and

(6) the enhancement of United States industrial and economic competitiveness and productivity by improving the free flow of people and commerce and by establishing a significant United States presence in an emerging field of technology.

SEC. 653. GENERAL AUTHORITIES AND REQUIREMENTS.

(a) CONSULTATION WITH OTHER FEDERAL AGENCIES.—In carrying out the program under this part, the Secretary shall consult with the Secretary of Commerce, the Administrator of the Environmental Protection Agency, the Director of the National Science Foundation, and the heads of other interested Federal departments and agencies.

(b) STANDARDS.—The Secretary shall develop and implement standards and protocols to promote the widespread use and evaluation of intelligent vehicle-highway systems technology as a component of the Nation's surface transportation systems. To the extent practicable, such standards and protocols shall promote compatibility among intelligent vehicle-highway systems technologies implemented throughout the States. In carrying out this subsection, the Secretary may use the services of such existing standards-setting organizations as the Secretary determines appropriate.

(c) EVALUATION GUIDELINES.—The Secretary shall establish guidelines and requirements for the evaluation of field and related operational tests carried out pursuant to section 655. Any survey, questionnaire, or interview which the Secretary considers necessary to carry out the evaluation of such tests shall not be subject to the requirements of the Paperwork Reduction Act (44 U.S.C. 3501 et seq.).

(d) INFORMATION CLEARINGHOUSE.—

(1) ESTABLISHMENT.—The Secretary shall establish and maintain a repository for technical and safety data collected as a result of federally sponsored projects carried out pursuant to this part and shall make, upon request, such information (except for proprietary information and data) readily available to all users of the repository at an appropriate cost.

(2) DELEGATION OF AUTHORITY.—The Secretary may delegate the responsibility of the Secretary under this subsection, with continuing oversight by the Secretary, to an appropriate entity not within the Department of Transportation. If the Secretary delegates such responsibility, the entity to which such responsibility is delegated shall be eligible for Federal assistance under this part.

(e) ADVISORY COMMITTEES.—The Secretary may utilize one or more advisory committees in carrying out this part. Any advisory committee so utilized shall be subject to the Federal Advisory Committee Act. Funding provided for any such committee shall be available from moneys appropriated for advisory committees as specified in relevant appropriations Acts and from funds allocated for research, development, and implementation activities in connection with the intelligent vehicle-highway systems program under this part.

SEC. 654. STRATEGIC PLAN, IMPLEMENTATION, AND REPORT TO CONGRESS.

(a) STRATEGIC PLAN.—

(1) DEVELOPMENT AND IMPLEMENTATION.—Not later than 1 year after the date of the enactment of this Act, the Secretary shall develop, submit to Con-

gress, and commence implementation of a plan for the intelligent vehicle-highway systems program.

(2) SCOPE.—The plan shall—

(A) specify the goals and objectives of the intelligent vehicle-highway program and how specific projects relate to the goals and objectives, including consideration of the 5, 10, and 20–year timeframes for the goals and objectives;

(B) detail the status of and challenges and nontechnical constraints facing the program;

(C) establish a course of action necessary to achieve the program's goals and objectives;

(D) provide for the development of standards and protocols by the Department of Transportation to promote and ensure compatibility in the implementation of intelligent vehicle-highway systems technologies; and

(E) provide for the accelerated use of advanced technology to enhance traffic safety and reduce traffic congestion.

(b) INTELLIGENT VEHICLE HIGHWAY SYSTEMS.—The Secretary shall develop a completely automated highway and vehicle system which can become a prototype from which future fully automated intelligent vehicle-highway systems can be developed. Such development shall include

research in human factors to ensure the success of the man-machine relationship. The goal of this program is to have the first fully automated roadway in operation by the end of 1997. This system shall accommodate installation of equipment in new and existing motor vehicles.

(c) IMPLEMENTATION REPORTS.—

(1) IN GENERAL.—Not later than 2 years after the date of the enactment of this Act, and annually thereafter, the Secretary shall submit to Congress a report on the implementation of the plan developed under subsection (a).

(2) SCOPE OF IMPLEMENTATION REPORTS.—In preparing reports under this subsection, the Secretary shall—

(A) analyze the possible and actual accomplishments of intelligent vehicle-highway systems projects in achieving congestion, safety, environmental, and energy conservation goals and objectives of the program;

(B) specify cost-sharing arrangements made, including the scope and nature of Federal investment, in any research, development, or implementation project under the program;

(C) assess nontechnical problems and constraints identified as a result of each such implementation project; and

(D) include any recommendations of the Secretary for legislation or modification to the plan developed under subsection (a).

(d) NONTECHNICAL CONSTRAINTS.—

(1) REPORT TO CONGRESS.—In cooperation with the Attorney General and the Secretary of Commerce, the Secretary shall prepare and submit, within 2 years after the date of the enactment of this Act, a report to Congress addressing the nontechnical constraints and barriers to implementation of the intelligent vehicle-highway systems program.

(2) SCOPE OF REPORT.—The report shall—

(A) address antitrust, privacy, educational and staffing needs, patent, liability, standards, and other constraints, barriers, or concerns relating to the intelligent vehicle-highway systems program;

(B) recommend legislative and administrative actions necessary to further the program; and

(C) address ways to further promote industry and State and local government involvement in the program.

(3) UPDATE OF REPORT.—Not later than 5 years after the date of the enactment of this Act, the Secretary shall prepare and submit to Congress an update of the report under this subsection.

SEC. 655. TECHNICAL, PLANNING, AND OPERATIONAL TESTING PROJECT ASSISTANCE.

(a) TECHNICAL ASSISTANCE AND INFORMATION.—The Secretary may provide planning and technical assistance and information to State and local governments seeking to use and evaluate intelligent vehicle-highway systems technologies. In doing so, the Secretary shall assist State and local officials in developing plans for areawide traffic management control centers, necessary laws pertaining to establishment and implementation of such systems, and plans for infrastructure for such systems and in conducting other activities necessary for the intelligent vehicle-highway systems program.

(b) PLANNING GRANTS.—The Secretary may make grants to State and local governments for feasibility and planning studies for development and implementation of intelligent vehicle-highway systems. Such grants shall be

made at such time, in such amounts, and subject to such conditions as the Secretary may determine.

(c) ELIGIBILITY OF CERTAIN TRAFFIC MANAGEMENT ENTITIES.—Any interagency traffic and incident management entity, including independent public authorities or agencies, contracted by a State department of transportation for implementation of a traffic management system for a designated corridor is eligible to receive Federal assistance under this part through the State department of transportation.

(d) OPERATIONAL TESTING PROJECTS.—The Secretary may make grants to State and local governments for operational tests relating to intelligent vehicle-highway systems. In deciding which projects to fund under this subsection, the Secretary shall—

(1) give the highest priority to those projects that—

(A) will contribute to the goals and objectives specified in plan developed under section 654; and

(B) will minimize the relative percentage of Federal contributions (excluding funds apportioned under section 104 of title 23, United States Code) to total project costs;

(2) seek to fund operational tests that advance the current state of knowledge and, where appropriate, build on successes achieved in previously funded work involving such systems; and

(3) require that operational tests utilizing Federal funds under this part have a written evaluation of the intelligent vehicle-highway systems technologies investigated and of the results of the investigation which is consistent with the guidelines developed pursuant to section 653(c).

(e) AUTHORITY TO USE FUNDS.—Each State and eligible local entity is authorized to use funds provided under this part for implementation purposes in connection with the intelligent vehicle-highway systems program.

SEC. 656. APPLICATIONS OF TECHNOLOGY.

(a) IVHS CORRIDORS PROGRAM.—The Secretary shall designate transportation corridors in which application of intelligent vehicle-highway systems will have particular benefit and, through financial and technical assistance under this part, shall assist in the development and implementation of such systems.

(b) PRIORITIES.—In providing funding for corridors under this section, the Secretary shall allocate not less than 50 percent of the funds made available to carry out this section to eligible State or local entities for application of

intelligent vehicle-highway systems in not less than 3 but not more than 10 corridors with the following characteristics:

(1) Traffic density (as a measurement of vehicle miles traveled per highway mile) at least 1.5 times the national average for such class of highway.

(2) Severe or extreme nonattainment for ozone under the Clean Air Act, as determined by the Administrator of the Environmental Protection Agency.

(3) A variety of types of transportation facilities, such as highways, bridges, tunnels, and toll and nontoll facilities.

(4) Inability to significantly expand capacity of existing surface transportation facilities.

(5) A significant mix of passenger, transit, and commercial motor carrier traffic.

(6) Complexity of traffic patterns.

(7) Potential contribution to the implementation of the Secretary's plan developed under section 654.

(c) OTHER CORRIDORS AND AREAS.—After the allocation pursuant to subsection (b), the balance of funds made available to carry out this section shall be allocated to eligible State and local entities for application of intelligent vehicle-highway systems in corridors and areas where the ap-

plication of such systems and associated technologies will demonstrate benefits related to any of the following:

(1) Improved operational efficiency.

(2) Reduced regulatory burden.

(3) Improved commercial productivity.

(4) Improved safety.

(5) Enhanced motorist and traveler performance.

Such corridors and areas may be in both urban and rural areas and may be interstate and intercity corridors. Urban corridors shall have a significant number of the characteristics set forth in subsection (b).

SEC. 657. COMMERCIAL MOTOR VEHICLE SAFETY TECHNOLOGY.

(a) STUDY.—The Secretary shall conduct a study to evaluate technology which is designed for installation on a commercial motor vehicle to provide the individual operating the vehicle with a warning if a turn, lane change, or other intended movement of the vehicle by the operator will place the vehicle in the path of an adjacent object or vehicle.

(b) REPORT.—Not later than 2 years after the date of the enactment of this Act, the Secretary shall transmit to the Committee on Public Works and Transportation of the House of Representatives and the Committee on Environment and Public Works of the Senate a report contain-

ing findings and recommendations concerning the study conducted under this section.

SEC. 658. FUNDING.

(a) IVHS CORRIDORS PROGRAM.—For carrying out section 656, the Secretary shall make available from funds deducted pursuant to section 104(a) of title 23, United States Code, $150,000,000 per fiscal year for each of fiscal years 1992, 1993, 1994, 1995, and 1996; except that if the Secretary does not allocate a portion of the amounts to be made available for carrying out section 656 for fiscal years 1992 and 1993, the Secretary may use such remaining portion for carrying out other activities authorized under this part, in addition to amounts to be made available for such purposes under subsection (b). Such funds shall remain available until expended.

(b) OTHER IVHS ACTIVITIES.—For carrying out this part, other than section 656, the Secretary shall make available from funds deducted pursuant to section 104(a) of title 23, United States Code, not less than $50,000,000 per fiscal year for each of fiscal years 1992, 1993, 1994, 1995, and 1996. Such funds shall remain available until expended.

(c) RESERVATION OF FUNDS.—Of the funds made available pursuant to subsection (a), not less than 5 percent shall only be available for innovative, high-risk operational or analytical tests that do not attract substantial non-Fed-

eral commitments but are determined by the Secretary as having significant potential to help accomplish long-term goals established by the plan developed pursuant to section 654.

(d) FEDERAL SHARE PAYABLE.—The Federal share payable on account of activities carried out under this part shall not exceed 80 percent of the cost of such activities. The Secretary may waive application of the preceding sentence for projects undertaken pursuant to subsection (c) of this section.

SEC. 659. DEFINITIONS.

For the purposes of this part, the following definitions apply:

(1) IVHS.—The term "intelligent vehicle-high way systems" means the development or application of electronics, communications, or information processing (including advanced traffic management systems, commercial and advanced vehicle advanced traveler information systems, commercial and advanced vehicle control systems, satellite vehicle tracking systems, and advanced vehicle communications systems) used singly or in combination to improve the efficiency and safety of surface transportation systems.

(2) CORRIDOR.—The term "corridor" means any major transportation route which includes parallel limited access highways, major arterials, or transit lines; and, with regard to traffic incident management, such term may include more distant transportation routes that can serve as viable options to each other in the event of traffic incidents.

(3) STATE.—The term "State" has the meaning such term has under section 101 of title 23, United States Code.

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102D CONGRESS
1st Session

HOUSE OF REPRESENTATIVES

REPT. 102-171
Part 1

INTERMODAL SURFACE TRANSPORTATION INFRASTRUCTURE ACT OF 1991

JULY 26, 1991.—Ordered to be printed

Mr. ROE, from the Committee on Public Works and Transportation, submitted the following

REPORT

[To accompany H.R. 2950]

The Committee on Public Works and Transportation, to whom was referred the bill (H.R. 2950) to develop a national intermodal surface transportation system, to authorize funds for construction of highways, for highway safety programs, and for mass transit programs, and for other purposes, having considered the same, report favorably thereon with an amendment and recommend that the bill as amended do pass.

The amendment in the nature of a substitute appears in italic in the reported bill.

BUILDING THE SURFACE TRANSPORTATION SYSTEM

The quality of life enjoyed by the great majority of Americans today is due in large measure to the visionary leadership provided over the course of more than two centuries in building, expanding and maintaining a sound and pervasive surface transportation system. It has profoundly changed the way Americans live and work.

While the beginnings may have been primitive, the vision was there, along with the very early realization that mobility would end regional isolation and literally unite the Nation. As early as 1775, the Continental Congress passed a resolution and ordinance dealing with the establishment of post roads and post offices, and, thus, the Federal Highway program had its earliest beginnings.

As road traffic increased, more post roads were built, and in 1806, Congress authorized construction of the National Pike or Cumberland Road, which eventually linked the land west of the Allegheny Mountains and the eastern seaboard. At the same time,

relieve congestion and enhance safety at Exit 16 of the Ohio Turnpike.

One final note merits mentioning. It is that the words "regular or periodic basis" have the meaning that is implied in section 119 of title I of this bill and which is explained in title I of this report in the section entitled Gross Vehicle Weight Restrictions.

(5) LONGER COMBINATION VEHICLES, REGULATIONS, STUDIES, AND TESTING.

Earlier in this report, the Committee plainly stated its concerns about longer combination vehicles (LCVs). In order to secure more information about the safety of these vehicles, it is requesting the General Accounting Office to conduct a study of the safety of LCVs.

The Committee has also directed the Department to undertake a series of activities relative to the operation of longer combination vehicles. First, Department is required to issue regulations for establishing minimum training requirements for drivers of LCVs. Secondly, it is required to conduct a study and to file a report on the effects of operating LCVs on drivers. Thirdly, the Department must test LCVs. The purpose of the prior two requirements is to determine whether the safety regulations contained in Subchapter B of Chapter III of title 49 of the Code of Federal Regulations need to be modified as they apply to LCVs.

Title VI—Research

From 1980 to 1987 Federal spending on transportation research and development declined by 40 percent. While key economic competitors like Japan and West Germany spent 2.8 percent and 2.5 percent on non-defense research as compared to gross national product, the United States spent only 1.8 percent. Within the Federal highway program, only .2 percent of expenditures were dedicated to research.

The decline in Federal support for new transportation ideas and technology has left the national poorly prepared to maintain its position in the world marketplace and to confront the problems posed by growing congestion, energy consumption, and pollution of the environment. To regain lost ground technologically and avoid buying back "perfected" versions of American technologies from international competitors, the Federal government must exercise the same level of leadership that is provided by governments of competing nations.

(1) MAJOR ISSUES

Recognizing the need for a strong research, development, and technology transfer program that looks not only at domestic needs and progress but developments worldwide, the U.S. Department of Transportation has recommended to Congress several changes in law which are incorporated in H.R. 2950.

H.R. 2950 provides authority for the Department of Transportation to conduct an International Outreach Program to enhance the U.S. technical presence in developed and developing countries and to provide better support for U.S. private sector firms in the inter-

national marketplace. One aspect of the program would focus on monitoring, assessing and disseminating foreign highway, transit, and intermodal innovations domestically that could have beneficial application in the U.S. In recent years great international emphasis has been placed on research and development in the private sector. As a consequence, the U.S. needs increasingly to devote more resources to keeping abreast of technical developments abroad with a view to applying foreign research results at home and avoid wasting scarce resources on duplicative work. The activities the Department of Transportation would be authorized to engage in under this program include exchanging U.S. and foreign public-sector experts; demonstrating in the U.S. of foreign innovative equipment, materials, and techniques; and sending teams of U.S. public sector experts on technology assessment missions abroad.

Equally important, the Department must conduct efforts to increase transfers of American technology to developing regions of the world. Through a program of U.S. technology transfer, developing countries could gain access to needed U.S. technology while related efforts would enable American technology firms to adapt to the particular needs and conditions of developing regions. One specific activity envisioned in this program is support for international regional technology transfer centers under American leadership modeled on the Pan American Institute of Highways.

An additional aim of the international outreach program is to demonstrate U.S. highway, transit and intermodal expertise with the goal of helping U.S. technology compete for business in foreign markets. This program of promotion of U.S. technology may include sponsoring seminars, exhibits, demonstrations, technical visits, training sessions in the U.S. and abroad and supporting U.S. membership in international organizations. U.S. government assistance is particularly needed in the transportation sector where competition for markets is fiercely contested by other countries' governments and firms acting in concert, where considerable U.S. expertise resides in the public sector, and where U.S. government representatives have easier access to the primary customer, foreign government agencies.

(2) BACKGROUND AND FINDINGS

The Committee believes that the present R&D program at the Department of Transportation is uncoordinated and further, that the United States will risk falling further behind other industrial nations' surface transportation programs because we have not maintained a strong and aggressive research and development program encompassing a broad range of technologies.

Though some limited coordination of R&D continues through the Department's R&D Coordinating Council, DOT no longer has a department-wide R&D coordinator within the Office of the Secretary of Transportation. Such a position was briefly re-created in 1985, but dropped again after proving ineffective. As a result of budget cutbacks and the lack of coordination for R&D over the past decade, each administration's R&D program has become increasingly modally oriented and focused on supporting short-term pro-

gram objectives. The April 1991 OTA report "Delivering the Goods", found that "the lack of long-range and systems-oriented R&D has left DOT unprepared to address current national needs, such as transportation-related air quality issues and intermodal and urban capacity problems."

In the Department of Transportation's February 1990 publication, "Moving America; New Directions, New Opportunites, the Administration has stated its objectives:

1. "Increase the Federal transportation budget for research and technology projects, in coordination with the efforts of private industry, the academic community, and state and local governments.
2. Continue research on improvements in design and operation of existing vehicles and transportation systems.
3. Provide seed money for research on new transportation systems and technologies, and assist in assessing their feasibility.
4. Foster a program of national research in transportation at the country's universities and research institutions.
5. Promote adoption of new technologies and reassert U.S. international technical leadership in transportation by fostering increased awareness of and interest in research and development activities."

The Committee has endorsed these objectives as related to research. However, the Committee is gravely concerned about the ability of the Department to apply sufficient resources and to persevere in developing a range of new technologies.

The Department reports that the United States spends approximately $424 billion per year on surface transportation. In spite of this large amount of money, very little is spent on research and development by the government or the private sector. The history of research and development within the Department of Transportation does not provide confidence for expecting improvements in developing the transportation systems of tomorrow without H.R. 2950.

(3) TECHNOLOGY ASSISTANCE, EDUCATION, AND TRAINING

H.R. 2950 authorizes the Department to expand its education and training programs to meet growing domestic and international needs for technical assistance. Local transportation assistance programs will be continued to assist local governments in rural and small urban areas to deal effectively with transportation problems. The direct benefit of applying improved technology in these areas is greater efficiency and productivity in transportation, but benefits may also be measured in cost-avoidance, direct reductions in budgetary spending in some cases, and safety.

Expansion of the National Highway Institute will enhance technology transfer efforts by providing specific technology training courses at locations throughout the U.S. for highway engineers and technical staffs to keep them up to date on the newest technology, tests, procedures, and operations techniques. The NHI also will conduct sessions to assemble national and world experts for education and training exchange. The NHI should envision its role as

the principal resource for presenting the leading edge of highway technology to the governmental sector of the national and international highway community and private sector organizations and individuals that are essential to highway transportation.

(4) NATIONAL TRANSIT INSTITUTE

The success of the National Highway Institute leads the Committee to believe a parallel education and training mechanism should be established to further the adoption of the latest processes and technologies in the transit industry. Using the resources of Rutgers University, the National Transit Institute will increase the training given to transit officials at all levels of government, making them more amenable to implementing new transit technologies.

(5) STRATEGIC HIGHWAY RESEARCH PROGRAM

The 1987 Surface Transportation and Uniform Relocation Act established the Strategic Highway Research Program (S.H.R.P.) as a highly focused, five-year research program. S.H.R.P. evolved from start-up in 1988 to full scale operation in 1989 as the largest single highway research program in the United States, representing about one quarter of the Nation's total current spending for highway research. S.H.R.P.'s concentrated attack on practical problems of highway agencies attracted the attention and participation of country, state, national and international organizations.

S.H.R.P. research addresses four technical areas of investigation: asphalt, concrete and structures, highway operations, and long-term pavement performance. S.H.R.P. results on performance-based specifications for asphalt pavement materials, better means of controlling corrosion in steel-reinforced concrete structures, and improved products and processes for snow and ice removal are some of the areas approaching the stage for implementation, and H.R. 2950 directs the Department to conduct a program of technology transfer to encourage application and adoption of S.H.R.P. results. DOT also is directed to continue the long-term pavement performance program for improvement of pavement design and maintenance initiated under S.H.R.P. Long-term performance data on different types of pavements under different conditions will be collected at approximately 2,500 in-service test sections located throughout the U.S. and Canada. Long-term studies of environmental effects in the absence of heavy loads must also be conducted.

The Committee is aware of the current commitment of the Department of Transportation to implementation of S.H.R.P. results and carrying out the long-term pavement performance test but recognizes the potential for changes in policy under different conditions or Department administration. Understanding that states undertake substantial commitments to conduct the long-term pavement tests, the Committee believes states should be guaranteed that the Federal government will carry out its long-term commitment as well.

(6) APPLIED TECHNOLOGY

With the S.H.R.P. program as a model and seeing the potential efficiency and productivity offered by implementation of S.H.R.P.

results, the Committee wishes to lift the horizon on the application of new technologies nationwide. H.R. 2950 would direct the Secretary of Transportation to implement an Applied Technology program to accelerate the application and testing of new highway, transit, and intermodal, technologies across the country under varying conditions. DOT is required to specify guidelines to ensure that materials, processes, and techniques are tested in a variety of climatic, geographic, traffic, and environmental conditions and determine data collection and evaluation procedures to achieve the appropriate level of comparability of testing results.

Technologies to be implemented will be those designed to improve the durability, efficiency, environmental impact, productivity, and safety of highway, transit and intermodal transportation systems. While DOT is given broad discretion in implementation of technologies, many examples of the materials, processes and techniques this program is designed to test can be cited.

In the roadway, for example, an innovative European pavement technology, Stone Mastic Asphalt, incorporates high quality aggregate, modified polymers, and strict quality control to lead to a more durable, rut resistant, load carrying surface that has the potential of extending pavement life by nearly 15 percent. Drainable bases under concrete pavement have the capability of extending the service life of pavement by rapidly removing all infiltrating surface water from underneath the pavement before damage can occur. Concrete paving mixes can be designed for opening routes to traffic in less than 12 hours. For structural concrete, mixes can be designed for durability, for corrosion protection, and for strengths exceeding 14,000 psi. New practices and hardware devices such as advanced guiderail end terminals and attenuators, breakaway utility poles, equipment and devices to improve night vision, and measures to improve highway travel for an aging population all can make the roadway environment safer for the traveling public and the highway worker.

Examples of technologies which may be tested under this program in transit systems include new materials such as composites and other materials which may possess attributes such as higher strength or low noise, toxicity, or flammability. Reduced emission transit vehicle technologies, such as advanced methanol, natural gas, propane, and diesel buses might be evaluated and implemented, as well as zero emission transit technologies such as fuel cell, hydrogen, and electric powered buses. Accessibility subsystems, such as ramps, low floor vehicles, and lifts are areas that should be considered for this program.

Specific programs for evaluation and implementation of the benefits of heated bridge deck technologies, elastomer modified asphalt, and all weather pavement markings are required. Retroreflective all-weather pavement markings should provide substantial safety benefits for older drivers operating vehicles at night.

(7) INFRASTRUCTURE RESEARCH

The DOT research policy in infrastructure is explained in the January 1991 "United States Department of Transportation Research and Development Policy". The goal of the research program

is to "maintain and expand the Nation's transportation system—which will be supported by research to improve the capacity, condition, and utilization of existing transportation systems and infrastructure."

This is not a comprehensive infrastructure program, according to OTA. The June 1991 publication "Moving Ahead: 1991 Surface Transportation Legislation", stated that top priorities for short-term R&D are "technologies that address maintenance rehabilitation, and system prevention. . . ." In addition, the report addressed long-range research by concluding, "Long-range planning and R&D that look ahead to future problems simply do not exist at DOT, and this is a serious deficiency."

The Committee believes that both short and long-term surface transportation infrastructure research programs at the Department are inadequate to solve today's or tomorrow's problems in a cost-effective, timely manner.

The Nation's surface transportation infrastructure has reached a serious state of disrepair. H.R. 2950 has provided for new construction which will alleviate many existing problems in surface transportation. However, research and development of new materials, construction and maintenance methods, new machinery including the use of robotics and new non-destructive examination techniques and equipment will become even more essential to all surface transportation modes in the future.

This section calls for research into the use of high energy radiography as a means of detecting deterioration in structures while the deterioration is still in the early stages. It is the intent of the Committee that the Department investigate this area, and confer with experts in the national laboratories, universities and private industry, as appropriate, in order to determine the feasibility, the range, of deployment and cost/benefits associated with this technology.

The Committee is also concerned about the influx of heavy construction equipment from foreign nations. The concern is whether or not the private sector is able to develop innovative more productive, easy to operate, and reliable equipment.

Accordingly, the Committee authorizes the Secretary to establish a comprehensive infrastructure research program. To be included in the program is a research effort to develop non-destructive evaluation (NDE) equipment. The goal of this effort is to produce technologies that can detect corrosion, wear, and structural flaws, of bridges and other load-bearing structures in the field. Enormous savings in both time and money would result from such field testing. Further, the Committee believes that in order to develop a comprehensive program of infrastructure research, adequate data on the current status and future infrastructure needs is necessary.

The June 1991 OTA Report stated that, "At present we are making decisions about billions of dollars in Federal expenditures based on 15-year-old data that were inadequate to begin with." The Department has taken steps to initiate research in this area. The January 1991 DOT R&D policy states that DOT believes it is appropriate to sponsor research to "experiment with innovative ways to make Federal Transportation data, research findings, and information on technology and innovation in transportation available to researchers, industry and all levels of government."

The Committee, however, believes this effort is inadequate, especially in long-term infrastructure research. Accordingly, the Committee authorizes a comprehensive data collection and utilization program that will be beneficial in planning both for short and long-term research. Moreover, this computer data-based program should be able to predict future capacity, safety and infrastructure durability problems. This will be especially important for new and innovative materials that will be utilized in future infrastructure. The Committee has also authorized a program requiring that the computer-based system be available for evaluating proposed infrastructure research programs to determine potential problems and strengths before the products of the research are implemented in the field.

Finally, the Committee directs the Department to develop a computer-based data research program that can be used to evaluate the strengths and weaknesses of research plans and technologies to be implemented in the field. The goal of the research program is to improve effectiveness and efficiency of traffic patterns during rehabilitation and field construction, thereby minimizing traffic disruption while maximizing infrastructure construction opportunities.

This computer based research program is similar to one mandated for DOT's Federal Aviation Administration by Public Law 100-591.

(8) STATE PLANNING AND RESEARCH

H.R. 2950 requires that at least 25 percent of state planning and research funds be spent by states on research, development and technology transfer activities. In light of the need to consider greater integration of highway, transit, and intermodal systems, state research funds may be used for research and development purposes in the planning, design, construction, and maintenance of such systems.

(9) SEISMIC RESEARCH

As the Loma Prieta earthquake of 1989 illustrated, the infrastructure of the United States remains extremely vulnerable to earthquakes. Both the Cypress Viaduct and San Francisco Bay Bridge suffered severe damage during that incident which resulted in the deaths of 42 people. There are over 9,700 bridges in California alone that were built before the higher earthquake building code came into effect. In the eastern United States, virtually no bridges have been constructed with seismic safety in mind.

The result of this inattention to a remote but very real danger is that much of the national highway system is vulnerable to a moderate size earthquake. Experts predict that there is a 40 to 60 percent chance of an earthquake of at least a magnitude 6.0 in the eastern United States before 2020. The most violent earthquake in U.S. history took place in the New Madrid area of Missouri in 1811, and Charleston, South Carolina was virtually levelled in 1886.

Recognizing this danger and the scarce resources currently dedicated to preventing earthquake damage, the Committee directs the Department to fund research on seismic safety at a level of up to

$4 million per year. Specifically, the Committee requires an assessment of the seismic vulnerability of U.S. highway systems and an examination of cost-effective methods for retrofitting existing facilities in cooperation with a nationally recognized earthquake engineering research facility.

(10) QUALITY ASSURANCE

Because the Nation's highway, transit, and intermodal transportation systems are among our most vital assets, methods to ensure high quality construction and maintenance merit serious consideration. Statistical quality assurance practices are currently in use or under development in approximately three quarters of the states and have been found to be an effective tool to encourage high quality construction. There is, however, great disparity in the application of statistical quality assurance methodology from state to state and many current practices and published standards are far from optimal.

H.R. 2950 requires the Department of Transportation to evaluate state statistical quality assurance practices and assess the need for a national quality assurance policy.

(11) DOT DATA NEEDS STUDY

The recent Office of Technology Assessment report, "Moving Ahead," observed that accurate baseline data and performance measures are critical to improving transportation system performance. The report notes, however, that transportation data collection was severely curtailed in the 1980s, making it difficult to develop good performance goals. H.R. 2950 requires a National Academy of Sciences evaluation of Department of Transportation data collection processes and capabilities as a first step toward development of reliable, comprehensive system performance measures. The Committee anticipates that the National Academy of Sciences study will serve as a foundation for making informed decisions on further requirements for collection of data and development of statistics within the Department of Transportation.

(12) UNIVERSITY TRANSPORTATION CENTERS AND RESEARCH INSTITUTES

H.R 2950 builds upon the successes of the University Transportation Centers established pursuant to the 1987 Surface Transportation and Uniform Relocation Assistance, designating three new centers: a national center for transportation management research, and development; a center for transportation and industrial productivity; and a national rural transportation study center. The requirement that the Secretary provide for the establishment and operation of a clearinghouse between the centers should not be interpreted to require transfer of such functions from the center currently serving as a clearinghouse. Two University Research Institutes are required to be established to conduct national surface transportation policy studies and infrastructure research, training, and technology transfer.

(13) BUS TESTING

Various changes are made to the operational requirements of the Altoona Bus Testing Center. Additional testing shall include the determination of emission levels produced while operating on the same duty cycle as the existing fuel economy test. This established operating duty cycle will be simulated in a controlled environmental test chamber using a chassis dynamometer.

Brake performance testing shall also be included as an additional method for defining the safety characteristics of the test vehicle. The brake testing can include, but not be limited to, testing to determine when and if fading will occur under stop and go cycles.

Funding appropriated for this additional testing will be needed for development of the tests and procedures and will be utilized in the purchase of necessary test equipment and in the development of associated facilities.

In establishing the revolving loan fund for the Bus Testing Center, the Committee desires to achieve two goals. First, to give the testing facility an air of permanency and secondly, to support the research at the facility in times when no bus manufacturers are in need of testing.

In programming the use of the revolving loan fund, it is the Committee's intent to allow the operators of the testing facility to borrow from the fund to only cover operating expenses brought on by a lack of vehicles to be tested. The money will be loaned interest free for a period of two years. If any loan remains unpaid for three years, an interest rate of 3% will apply to any remaining unpaid balance, and in the fourth year an interest rate of 5% will apply. After five years, the interest rate will be fixed at 7%.

The Committee would like to clarify the Bus Testing Section 317(h)(1) of Public Law 101-17. In the opinion of the Committee the Requirement that "No funds appropriated or made available pursuant to this Act after September 30, 1989, may be obligated or expended for the acquisition of a new bus model unless a bus of such model has been tested at a facility established under section 310(b) of the Federal Mass Transportation Act of 1987" be interpreted as applying the responsibility on both the designated recipient of the funds and upon the Federal Transportation Administration as created under this Act to ensure that the above mentioned requirement is fulfilled.

(14) PLAN

The Committee believes that the Department's Transportation plan "Moving America" and the January 1991 statement on "Research and Development Policy" are good efforts. However, the Committee believes that the plan should be expanded, updated and submitted to Congress annually. One of the benefits of such an annual plan will be to provide a research program that, in the end, will serve to mobilize support for the Department's overseers in the Office of Management and Budget, the Committees of Congress with jurisdiction, and in the private sector.

The Committee requests that the plan be submitted in January, to coincide with the submission of the President's budget to Congress. The Department is to describe the plan in sufficient detail as

to assure the work conforms to the objectives contained in the Act. The plan is to be complete, identifying specific scopes of work, organization of personnel, milestone schedules, estimated costs by phase of activity, current state-of-the-art and accomplishments, problems, and plans and organization for future activities.

One of the fundamental concerns of the Committee in the development of new research for system projects is the accuracy of initial cost estimates. The Committee recognizes the difficulty in estimating costs before the full breadth of the work is sufficiently understood. For this reason, the Secretary is urged to consider planning in two stages. The first is to encompass the broad scope on a preliminary basis with research cost estimates clearly identified as being preliminary in nature. This is to be followed a year later with a second stage, which is a firm cost estimate for the technology to be developed from the research, from which the Congress can make informed decisions for budgeting purposes. The plan shall also include a 10-year long-term research and development program.

The Committee is aware that the Administration is generally unwilling to release budget figures until the President submits the budget at the beginning of each calendar year. In recognition of this, the Committee will accept the plan without budget information, so long as the detailed budget information to back up the plan is provided to the Committee concurrent with the President's budget. The first plan is due with the budget submission for fiscal year 1993.

Specifically, the plan should reflect the Committee's intent that the document show research budgets by project in the early years, but by general objective in the later years. In the first three years, program schedules, project costs, estimates of costs to complete each program, and major contracts, must be described.

The Committee recognizes the importance of technology transfer to commercial competitiveness. Inclusion of the provision requiring cooperation with industry in the Plan development should further this objective.

In order to prevent overlapping research, the Department will coordinate its planning efforts with other Federal agencies, as appropriate.

(15) NATIONAL COUNCIL ON SURFACE TRANSPORTATION RESEARCH

"Innovation, A Strategy for Research, Development, and Technology Transfer," aptly characterized the Nation's transportation research system as a complex array of interrelated programs. According to the report:

> This complexity, which flows from the decentralized nature of the Nation's transporation system, threatens the credibility and support for the system, and it creates a risk that inadequate coordination might lead to undesirable gaps or duplication in the total research effort.

This report, published by the American Association of State Highway and Transportation Officials, also identified the existence of barriers to innovation, such as organizational inertia or frag-

mentation of funding and policy responsibilities, which must be overcome if transportation research is to become effective.

H.R. 2950 establishes a National Council on Surface Transportation Research to conduct a close examination of these and other important transportation research issues. The Council is to be appointed by the President and Congress from among qualified individuals. While it is recognized that there are established organizations familiar with the problems the Council is organized to examine, Congress believes it is important to create a new, independent body to undertake this challenge.

Upon completion of its evaluation of the current state of transportation research, nationally and internationally, the Council must prepare a strategic plan for U.S. surface transportation research for immediate implementation and report its findings and recommendations to the Congress. Specifically, the Council must survey current public and private research efforts, examine factors which lead to fragmentation of research efforts, determine how greater coordination can be achieved, compare U.S. government policies on transportation research with those of other governments, identify barriers to innovation in surface transportation systems, examine various funding arrangements for research and assess the level of resources currently available, identify and determine priorities for research opportunities, and prepare a national strategic plan for surface transportation research.

(16) RESEARCH ADVISORY COMMITTEE

The Research Advisory Committee (RAC) is intended to insure that the Deartment take maximum advantage of available outside advice in planning and evaluating its research program and projects—especially the long-term efforts. It is also uppermost in the Committee's view that Department's research must both feed and be fed by the research programs of other organizations, and that the results of the Department's research must serve the interests of the surface transportation community of the United States. Both these objectives will be furthered by the establishment of the RAC, which is to be formed after the report by the National Council on Surface Transportation Research is submitted September 30, 1993.

The Committee intends that the RAC function under Department guidance and provide its advice to the Secretary. An annual reporting provisions has been included for public access to the activities of the Committee. The Secretary has the power to appoint RAC members, and the Committee intends that he do so directly. If the RAC is to be effective, it is vital that he select the surface transportation research experts who can provide the best advice. The Committee recommends that the Secretary appoint RAC members for short, staggered terms. To insure a succession of fresh views, no members should serve indefinitely, but to insure continuity, a staggered three-year term is recommended. The RAC is intended to solicit outside advice, and while the Department should encourage its research and operational staff to be available to the RAC and attend its meetings, the voting membership of the RAC should not include Department employees.

Appointees to the RAC should be selected on the basis of their technical knowledge of the state-of-the-art and of the requirements for the research, rather than as representatives of organizations. Yet the RAC would not be useful if major Department constituencies were ignored. The Committee realizes that the RAC would be impossibly large if, for example, all trade associations or universities sent representatives. The rotating terms should make it possible to broaden representation without having an unnecessarily large committee.

The Committee does not intend that RAC members be paid for their time, but recognizes that, in some instances, individuals cannot incur the transportation expenses necessary to participate. Staff support for the RAC is expected to be provided without reference to the limitation. The Committee is aware of certain funding limitations for advisory committees administered by the Department and the "application of certain limitations" clause is intended to exempt the RAC from this and other limitations.

The Committee expects that there will be a need for certain research advice which is too specialized to be effectively considered by the full Committee. The use of subordinate committees composed of experts with specialized backgrounds such as highway vehicle technology, is encouraged under the provision of the full RAC.

The Committee strongly believes that the Department should establish a state-of-the-art research program in advance highway vehicle technology. To ensure that the best scientific research programs in highway vehicle technology are conducted by the Department, a Subordinate Committee of the Research Advisory Committee on Highway Vehicle Technology, is established. The purpose of the permanent subordinate committee on highway vehicle R&D technology is to ensure that the agency has the best scientific advice available on which to establish a world leading research program.

(17) INTELLIGENT VEHICLE HIGHWAY SYSTEMS

Intelligent vehicle highway system (IVHS) technology represents the marriage of the vehicle, the driver, and the highway into a more effective and efficient integrated transportation system. It is a prime example of recent advances in U.S. transportation technology and expertise. Implementation of IVHS on a large scale will include substantial private industry involvement and progress on the vehicle side and a high level of government involvement on the highway side to achieve its objectives.

The IVHS program will be a major contributor in creating the level of highway safety and operational efficiency needed for the U.S. in the first two decades of the 21st century. Aggressive development and operational deployment of IVHS technologies will enhance our economic position, and a vigorous U.S. program will help this country maintain its competitive position with major European and Japanese government subsidized IVHS programs.

Overall IVHS consists of a family of individual technologies and systems on different development and deployment schedules. Some technology, especially in the traffic management area, is available

for implementation today. Other technologies require substantial research and testing. The IVHS program is broadly described as including four basic system areas: advanced traffic management systems; advanced driver information systems; commercial vehicle operations; and advanced vehicle control systems.

H.R. 2950 would establish a long-term IVHS program within the Department of Transportation with broad efficiency, environmental, safety, and competitiveness goals.

Pursuant to H.R. 2950, the Secretary would be required to develop or submit:

(1) Standards and protocols to promote compatibility among IVHS technologies;

(2) Guidelines for evaluation of field and operational tests;

(3) A strategic plan for IVHS, to be submitted to Congress, and regular reports to Congress on implementation of the strategic plan;

(4) A clearinghouse for technical and safety data;

(5) A report to Congress on the non-technical constraints and barriers to IVHS innovation;

(6) Means to assist state and local governments in the use and evaluation of IVHS technologies.

H.R 2950 also directs the Secretary to make grants for feasibility and planning studies for adoption of IVHS technologies, including areawide traffic management control centers.

For the implementation of IVHS systems, H.R. 2950 authorizes the use of $150 million for each of the fiscal years 1992 through 1996. Fifty percent of such funds shall be allocated for not less than three but not more than ten corridors with high traffic density; severe or extreme ozone nonattainment; a variety of types of transportation facilities; inability to significantly expand capacity; a significant mix of passenger, transit, and commercial traffic; complex traffic patterns; and potential contribution to the strategic plan.

The remainder may be used in rural and urban corridors or areas on IVHS systems that improve operational efficiency, improve safety, improve commercial productivity, reduce regulatory burdens, and enhance motorist and traveler performance. There is significant evidence that the greatest near-term safety, productivity, and efficiency gains may be realized through implementation of fleet-related IVHS technologies.

In addition, a minimum of $50 million in funding is authorized for meeting the other purpose of the IVHS program, including research, development, and operational testing.

The Secretary is given the discretion in fiscal years 1992 and 1993 to use such sums authorized for the IVHS corridors program as the Secretary deems appropriate for other IVHS purposes, including research, development, and operational testing. This program flexibility during the first two years is designed to address the many concerns that the $150 million for IVHS implementation would not be wisely used while critical needs in research, development, and operational testing would go unmet.

The intermodal nature of IVHS programs and potential benefits should be emphasized. The Federal Highway Administration and the Urban Mass Transportation Administration already have un-

derway a program to improve mobility through the implementation of comprehensive, intermodal, transportation management strategies. This initiative is designed to promote alternatives to single-occupant automobile travel.

H.R. 2950 directs the Department to study and evaluate, including an analysis for cost effectiveness, all available alternate vision systems and report to Congress in one year.

The potential for major gains in transportation safety through IVHS should also be stressed. A recent research report indicates that significant reductions in crashes, injuries, and fatalities could be achieved by improvement in IVHS crash avoidance technologies. Advanced vehicle control technologies are currently being tested that could provide drivers with a warning if an intended vehicle action, such as a lane change, will place the vehicle in the path of an adjacent object or vehicles. This technology is often referred to as blind spot monitoring or alternate vision systems. Alternate vision systems are designed to be used in conjunction with truck mirror systems to provide the driver with an active alert in the form of an audible tone alert or visual display when an object is detected in the driving blind spot. These systems will aid the driver in lane change, merge, and backing maneuvers.

(18) INTELLIGENT VEHICLE HIGHWAY SYSTEMS

Intelligent Vehicle Highway Systems (IVHS) are considered to be a primary research and development goal for surface transportation in the U.S. Americans love their cars and other modes of travel have not effectively deterred the average American from using his or her car.

The Committee is looking far into the future and calls for a completely automated highway prototype roadway with automated vehicles. The Committee recognizes this as an aggressive plan but is also aware that a basic technology for a completely automated roadway was developed in the early 1960s. At that time such a system was installed by RCA at the Research Laboratories in Princeton, New Jersey. The Committee sees no reason to "move slowly" with this technology. However, the Committee does not expect the Department of Transportation to have an active highway in full automatic operation, if it is not technologically feasible, by the aforementioned date.

(19) LONG-TERM RESEARCH

The Department addressed long-term programs in its January 1991 R&D statement, "It is the DOT R&D policy to structure and R&D program * * * that reflects a balance between meeting short-term needs and providing longer term options for system development." The OTA analysis, in the June 1991 report on "Delivering the Goods", concludes, "Long-range planning and R&D that look ahead to future problems simply do not exist at DOT. * * *"

The Committe finds that the Department's long-term research planning and programs are inadequate. In order to correct the problems the Committee authorizes 15 percent of all surface transportation research funds to be used in long-term research programs. In addition, long-term is defined to mean a research project

that will not be completed within 10 years unless a research "break through" occurs or similar unexpected progress is made and the project can be completed in a shorter time."

The Committee believes that the Department should conduct research that is devoted to long-term goals, as distinct from research that merely supports regulatory or acquisition projects. The Committee finds the Department research does not look far enough into the future and that current projects tend to focus on short-term, clearly achievable goals. This leads to the neglect of research on the more risky technologies which might have application only in the longer term.

The Committee agrees that the Department should expend most of its R&D resources on immediate problems; but the Committee feels DOT has largely ignored the long-term and, therefore, mandates that at least 15 percent of the available research be directed to the establishment of a 10-year or longer generic research program.

(20) SHORT HAUL PASSENGER TRANSPORTATION SYSTEMS

The Committee notes that there are effective short haul passenger transportation systems in operation in the U.S. today. One of the most effective, quite, safe, fast and energy efficient vehicles is the "trackless trolley". Although they are not new, technically speaking, they are effective. San Francisco and Philadelphia both have such systems in operation today. However, such systems are no longer accepted by the public because of the double overhead wires essential for powering them.

Diesel buses do continue to provide a vital service in filing the needs of commuters and providing the means to connect with other forms of transportation. Buses are necessary unless some other technology can be as effective. The Committee recognizes, in order to be effective, the new technology will have to be convenient, flexible, safe, clean and afforable.

To meet this need, the Committee looks to the Department to consider and study alternatives, and recommend a systems concept research program for short haul service, preferably battery powered. In doing this, the Committee notes that battery development has not progressed to the point where is can be readily used for most surface vehicles. In spite of research in such technologies as aluminum-air and sodium-sulfur batteries, the demands placed on batteries for transportation service far exceed the capabilities of existing technologies for anything but the lightest short-range applications. On the other hand, the application of deep discharge cells when used over short distances could make an electric short haul system practical if the cells could be made to withstand frequent, rapid recharging through many cycles.

Other features could also help make the concept practical. For example, solid rubber tires when used in conjunction with a new suspension technology could reduce electric power consumption thereby extending the range of the system. Another approach might be the use of fuel cells.

The Committee also believes research on this system is one possible technology that could allow us to advance ahead of foreign competition in surface transportation systems.

(21) DOT RESEARCH

Title 49 of the U.S. Code, subtitle I, lists the purposes of the Department of Transportation. The Committee believes that the Department purposes should also include basic research. Specifically, DOT is to promote and undertake research and development related to transportation. The Committee adds the requirement to ". . . *include basic highway vehicle* science." The Committee believes that DOT should have a mandate to conduct research in long-term, high risk basic highway vehicle science.

In addition, the Committee authorizes that title 49, subchapter I on the duties of the Secretary of DOT shall be amended to include that the Agency will stimulate technological advances in transportation *"through research and development."* The Committee believes that both basic scientific research and research in long-term, high risk highway vehicle sciences, aer very important. Accordingly, the Committee authorizes research to be included in the fundamental mandates of the Agency.

(22) AUTOMOTIVE CONFERENCE AND AWARD

The Stevenson-Wydler Technology Innovation Act of 1980 established a program to improve the Nation's industrial technology. The Act also establishes a National Technology Medal for companies that have made outstanding contributions to the promotion of technology.

The Committee believes that in order to examine and analyze the strengths and weaknesses of the U.S. motor vehicle industry, a conference on advanced automotive research technologies should be convened. Accordingly, the Committee authorizes that the Department of Commerce convene a conference of automotive experts to examine ways in which technology transfer of research results from the Federal laboratories can improve U.S. motor vehicle industrial competitiveness. The results of the conference will be published and submitted to Congress. It is the view of the Committee that the recommendations of the conference should focus on the research necessary to improve U.S. competitiveness in automotive technology.

In order to stimulate the U.S. automotive competitiveness the Committee recommends that the Secretary of DOT establish and award a medal to Federal laboratories, personnel or automotive industry personnel who have performed research and technology development which has contributed the most to the enhancement of U.S. industrial competitiveness. The Committee authorizes specific conditions for awarding the medal and believes such a medal will stimulate automotive research in the United States.

SECTION-BY-SECTION

SECTION 1—SHORT TITLE

This Act may be cited as the "Intermodal Surface Transportation Infrastructure Act of 1991".

SECTION 2. NATIONAL TRANSPORTATION POLICY; FINDINGS, AND PURPOSES

Subsection (a) establishes of a goal of the United States to develop a national intermodal transportation system.

Subsection (b), identifies the Congress' findings that relate to need to develop a national intermodal transportation system.

SECTION 3. STATEMENT OF PURPOSE

This section states the purpose of the Intermodal Surface Transportation Infrastructure Act of 1991.

SECTION 4. SECRETARY DEFINED

This section provides that the term "Secretary" when used in this Act, means the Secretary of Transportation.

SECTION 5—LIMITATION ON STATUTORY CONSTRUCTION

This section states that nothing in this Act shall be construed to apply to railroad or vessel transportation.

Title I—Federal-Aid Highways

SECTION 101. COMPLETION OF INTERSTATE SYSTEM

Subsection (a) declares that these are the final authorizations and apportionments for the completion of the construction of the Dwight D. Eisenhower National System of Interstate and Defense Highways to be made by Congress.

Subsection (b), approves the use of the apportionment factors contained in revised table 5 of the Committee Print 102-10 of the House Committee on Public Works and Transportation to apportion for all States (other than the State of Massachusetts) the Interstate construction funds authorized for fiscal year 1993.

Subsection (c) extends the apportionment period for Interstate construction five years to 1997.

Subsection (d) extends the administrative authority of the Secretary for fiscal years 1992, 1993, 1994, 1995, and 1996 to adjust the apportionment of Interstate construction funds to all states (other than Massachusetts) using the Federal share of the last Interstate cost estimate submitted to Congress. The Secretary will adjust the apportionment factors to reflect: (1) all previous credits, apportionments of Interstate construction funds and lapses of such funds, (2) previous withdrawals; (3) previous allocations of Interstate discretionary funds; and (4) Interstate transfers of funds.

Subsection (e) allocates funds to the State of Massachusetts to complete the remaining segments of the Interstate System. For Fiscal Year 1993 through 1997, a total of $2.45 billion is made available to the State of Massachusetts, from the amounts authorized for completion of the Interstate System.

Subsection (f) increases and extends the authorizations for Interstate construction at $2.2 billion for fiscal year 1993, $1.8 billion for both fiscal years 1994 and 1995, $1.5 billion for fiscal year 1996, and $800 million for fiscal year 1997.

Subsection (g) extends the declaration of policy to complete the Interstate System over the period of forty-one years.

SECTION 102. OBLIGATION CEILING

This section generally follows existing law in establishing a ceiling on obligations that may be incurred for Federal-aid highways and highway safety construction programs. The ceilings that are established are as follows:

(1) $12,993,000,000 for 1992;
(2) $14,452,000,000 for 1993;
(3) $16,687,500,000 for 1994;
(4) $19,050,000,000 for 1995;
(5) $21,435,000,000 for 1996.

Exempt from this ceiling are obligations incurred for emergency relief, minimum allocation, and projects constructed under section 128(h) (high cost bridge projects), section 134(c) (congestion relief projects), section 140 (high priority corridors on national highway system), section 149 (urban and rural access projects), section 157 (advanced technology projects), and section 505 (priority intermodal transportation projects). The obligation ceiling will also not apply to obligations incurred for demonstration projects authorized under Section 149 of the Surface Transportation and Uniform Relocation Assistance Act of 1987.

Also exempt from these obligation ceilings are obligations attributed to the Pay-As-You-Go program.

As under current law, obligation authority is distributed each fiscal year by formula, the amount that can be obligated during the first quarter of the year is limited to 35 percent by state and 25 percent nationally, and amounts that are unused are redistributed on August 1. States that use all of their obligation authority and any redistribution after August 1 are permitted up to 5 percent additional obligation authority.

A special rule is provided for Massachusetts, since Massachusetts is scheduled to receive a large amount of Interstate completion funds that it may not be able to obligate. If before the beginning of a fiscal year, Massachusetts indicates that it will not obligate any portion of its obligation authority, the Secretary is directed to distribute that portion to the other states.

The bill also provides that the urbanized areas over 200,000 in population will receive a distribution of obligation authority to go along with the urban mobility funds that are attributed to those areas. The provisions of section 150 of title 23 regarding transferability of allocated funds to other urban areas in the state at the request of the governor and upon approval of the governor and upon approval of the appropriate local officials of the area and the Secretary shall apply to the transfer of obligation authority as well.

The obligation ceilings for highway safety programs of the Federal Highway Administration under section 402 are as follows:

period, the Secretary is required to reapportion the withheld funds to the other states in accordance with the formula specified in subsection (c)(1) not later than 30 days after such determination is made.

Subsection (d)(1) provides contract authority for carrying out this section by applying the provisions of Chapter 1 of this title that are applicable to Federal-aid primary highway funds, other than provisions relating to the apportionment formula and provisions limiting the expenditure of such funds to the Federal-aid systems.

Subsection (d)(2) provides that the provisions of Chapter 1 shall not apply to funds authorized to be appropriated to carry out this section if the Secretary determines that a provision of chapter 1 of this title is inconsistent with this section.

Subsection (d)(3) permits the aggregate expenditures made by a state and its political subdivisions (exclusive of Federal funds) for carrying out the state highway safety program (other than planning and administration) to be credited to the non-Federal share of the cost of any project under this section (other than one for planning or administration).

Subsection (d)(4) authorizes the Secretary to increase the Federal share for a highway safety program carried out by an Indian tribe if the Secretary determines that such Indian tribe does not have sufficient funds available to meet the non-Federal share of the cost of such program.

Subsection (d)(5) defines the term "state highway department" to mean the Governor of a state.

Subsection (e) includes the Secretary of Interior in the definition of "state" and "Governor of a state" and an Indian tribe in the definition of "political subdivision of a state" and authorizes the Federal share apportioned to the Secretary of Interior at 95 percent for purposes of the application of this section.

Subsection (f) prohibits the use of any report, list, schedule, or survey prepared by or for a state or political subdivision thereof under the Uniform Data collection and Reporting Program or the Traffic Record System Program for purposes of any suit or court action.

Subsection (g) requires that not later than April 1 of each calendar year beginning after December 31, 1993, the Secretary shall report to Congress on the implementation of this section in the fiscal year preceding the date of such report. Such report shall include recommendations of the Secretary on legislation necessary to implement programs developed by the Secretary to reduce traffic-related deaths and injuries under the uniform data collection and reporting program described in subsection (a)(2)(E) of this section.

Subsection 201(b) establishes the effective date for the required and optional programs as October 1, 1992.

SECTION 202. HIGHWAY SAFETY RESEARCH AND DEVELOPMENT

Subsection 202(a), General Authority, Drugs and Driver Behavior, amends section 403 of Title 23, United States Code, by striking subsection (a) and (b) and inserting the following new subsections:

Subsection"(a)(1) authorizes the Secretary to use funds appropriated to carry out this section to engage in research on all phases of highway safety and traffic conditions.

Subsections "(a)(2)(A) through (a)(2)(F) provides additional authority for the Secretary to use the funds appropriated to carry out this section, either independently or in cooperation with other Federal departments or agencies, for training or education of highway safety personnel; research fellowships in highway safety; development of improved accident investigation procedures; emergency service plans; demonstration projects; and related research and development activities which the Secretary deems will promote the purposes of this section.

Subsection "(a)(3)" defines the term "safety".

Subsection "(b)" authorizes the Secretary, in consultation with other government and private agencies as may be necessary, to carry out safety research on the relationship between the consumption and use of drugs and their effect upon highway safety and drivers of motor vehicles; driver behavior research, including the characteristics of driver performance, the relationships of mental and physical abilities or disabilities to the driving task, and the relationship of frequency of driver crash involvement to highway safety.

Subsection (b) amends section 403 of Title 23, United States Code, by striking subsection (f) and inserting the following new subsection:

Subsection "(f) Collaborative Research and Development."

Subsection "(f)(1)" authorizes the Secretary to undertake, on a cost-shared basis, collaborative research and development with non-Federal entities, including state and local governments, colleges, and universities and corporations, partnerships, sole proprietorships, and trade associations that are incorporated or established under the laws of any state or the United States. This collaborative research may include crash data collection and analysis, driver and pedestrian behavior; and demonstrations of technology.

Subsection "(f)(2)" permits the Secretary to enter into cooperative research and development agreements, as defined in section 12 of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3710a). The Secretary may not provide more than 50 percent of the cost of any research or development project selected by the Secretary under this subsection.

Subsection "(f)(3)" requires the Secretary to establish a procedure to consider the views of experts and the public concerning the project areas.

Subsection "(f)(4)" requires that research, development, or utilization of any technology pursuant to an agreement under the provisions of this subsection, including the terms under which technology may be distributed, must be subject to the provisions of the Stevenson-Wydler Technology Innovation Act of 1980.

SECTION 203. ALCOHOL-IMPAIRED DRIVING COUNTERMEASURES

Subsection 203(a) amends section 410 of title 23, United States Code, with the following subsections:

New subsection 409(b) provides that the group must consult with the motor carrier industry.

New subsection 409(c) requires the working group must complete its original report within 24 months of the date of enactment. The report must be submitted to designated entities, and it must contain a detail statement of findings and conclusions along with joint recommendations. The group may thereafter continue to meet and to modify its original report and transmit a report with the modifications in the same manner and to the same entities as provided for in the original report.

New subsection 409(d) provides that the group is exempt from the Advisory Committee Act.

New subsection 409(e) provides that the Secretary may make grants of up to $1 million per year to help facilitate participation in the International Registration Plan. The grants may cover technical assistance, personnel training, travel costs, and technology and equipment associated with participating in the Plan. Funding is by contract authority.

New subsection 409(f) provides that after September 30, 1996, no state, except those participating in the Plan, shall establish, maintain, or enforce any commercial motor vehicle registration law, agreement, or regulation which limits the operation of any commercial motor vehicle within its borders which is not registered under the laws of that state if the commercial motor vehicle is registered under the laws of a state that is a participant in the International Registration Plan.

New subsection 409(g) provides the enforcement authority for this section.

New subsection 409(h) provides that this subsection does not limit the amount a state may charge for registration of commercial motor vehicle.

New subsection 409(i) provides funding for the working group and for the grant program.

New subsection 409(j) contains definitions.

SECTION 410. COMMON CARRIERS PROVIDING TRANSPORTATION FOR CHARITABLE PURPOSES

New section 410 amends Section 10723(b)(2) of title 49, U.S.C. to allow for animals trained to assist blind or disabled individuals to accompany them on common carriers or to allow dogs trained to assist a hearing impaired individual to accompany the individual at a rate equal to that of one individual.

SECTION 411. EFFECTIVE DATE; APPLICABILITY

New Section 411 establishes October 1, 1991 as the effective date of this title and provides that this title and amendments made by it applies only to funds authorized or made available after September 30, 1991.

Title VI—Research

Part A: Programs, Studies, and Activities

SECTION 601. RESEARCH AND TECHNOLOGY PROGRAM

This section amends the general research authority of the Secretary under section 307(a) to clarify authority to conduct research on motor carrier transportation, highway planning, and highway operations. The Secretary is authorized to engage in cost-shared collaborative research with non-Federal entities, including state and local governments, foreign governments, colleges and universities, corporations, institutions, partnerships, sole proprietorships, and trade associations. The average Federal share may not exceed 50 percent unless it can be demonstrated that there is substantial public interest or benefit. Funds to carry out collaborative research under this section shall be derived from section 104(a) administrative funds. Not less than 15 percent of the funds are to be used for long-term projects.

Section (b) directs the Secretary to develop an integrated national plan for surface transportation research and development, including a 10-year projection of long-term research and development. The initial plan is to be submitted by January 15, 1992, and thereafter updated annually. The Plan's objective is the development of short-term and long-term surface transportation systems.

Section (c) directs the Secretary to conduct systems research for a lightweight, rubber-tread multiple-unit system needed for a short haul passenger transportation system.

Section (d) is an expansion of transportation infrastructure research and development, including bridge materials, non-destructive testing, robotic road repair machinery, highway materials, and construction equipment research.

Section (e) of this section requires the Secretary to implement Strategic Highway Research Program results and continue long term pavement performance testing.

Section (f) of this section requires one and one-half percent of state apportionments under sections 104 and 144 be reserved to state research and planning purposes only, and requires that states use 25 percent of such funds for research, development, and technology transfer purposes. The scope of research conducted under this section is expanded to include public transportation and intermodal systems planning, design, construction, and maintenance.

SECTION 602. NATIONAL HIGHWAY INSTITUTE

This section amends Section 321 of Title 23 to continue the National Highway Institute (NHI) and remove the limitation on training to public sector employees working on Federal-aid highways. U.S. citizens and foreign nationals engaged in highway work of interest to the United States will be eligible for participation in NHI training programs. NHI is given specific authority to cooperate with national or international organizations to develop, conduct, and administer training to any national or international individual engaged or to be engaged in highway work of interest to the United States. The NHI is authorized to the work independently or

cooperatively with any national or international entity, and to collect fees for service and use such fees to improve exchange of highway technology with national and international entities.

NHI funding is provided through FHWA administrative funds set aside under Section 104(a). Monies collected by NHI for services provided may be joined with funds obtained from other cooperating organizations or individuals participating in NHI programs and be added to funds used by NHI in its programs or for expenditure for subsistence of employees of cooperating organizations attending training courses.

SECTION 603. EDUCATION AND TRAINING PROGRAM

This section continues and expands the Rural Transportation Assistance Program (RTAP) for transportation assistance to highway and transportation agencies in rural areas and urbanized areas of 50,000 to 1,000,000 in population. The Secretary is authorized to carry out the program through grants and contracts for education and training, technical assistance, and related support services that will (1) develop and expand rural local transportation agency expertise; (2) identify, package, and deliver useable highway technology to local urban jurisdictions; and (3) establish local technical assistance program centers.

SECTION 604. INTERNATIONAL TRANSPORTATION OUTREACH PROGRAM

This section adds a new section to Chapter 3 of title 23 directing the Secretary of Transportation to conduct an international transportation outreach program for highway, transit and intermodal activities. The purpose of the program is threefold: (1) to seek, evaluate, and disseminate information about innovations abroad for application in the U.S.; (2) to encourage use of American goods and services abroad; and (3) to assist developing countries to improve their surface transportation technology and institutions. Cooperative efforts with public, private, domestic, and foreign entities may be used to accomplish these purposes. Funds provided by cooperating organizations or persons may be held in a special account and used in furtherance of the outreach program.

SECTION 605. APPLIED RESEARCH AND TECHNOLOGY PROGRAM; SEISMIC RESEARCH PROGRAM

This section amends section 307 of Title 23 to require the Secretary to establish and implement an applied research and technology program. The purpose of the program is to accelerate testing, evaluation, and implementation of technologies that may improve the durability, efficiency, environmental impact, productivity, and safety of highway, transit, and intermodal transportation systems. Eighteen months after date of enactment, the Secretary must issue guidelines on selection of technologies, test locations, and collection and evaluation of test data. The Secretary is directed to carry out projects to assess the state of technology for heating bridge decks on a minimum of ten bridges being replaced or rehabilitated, to carry out a project demonstrating the environmental and safety benefits of elastomer modified asphalt, and to conduct a program to demonstrate the safety benefits and durability of all weather pave-

ment markings. Highway project carried out under this program must be conducted on the Federal-aid system.

The Secretary is required to transmit to Congress an annual report on the progress and findings of the applied technology program.

Funding for the applied technology program established under this section is derived from administrative and research funds set aside under section 104(a) of title 23 and section 21(h) of the Urban Mass Transportation Act of 1964 as amended at $50,000,000 per fiscal year for each of fiscal years 1992, 1993, 1994, 1995, and 1996. Not less than $5,000,000 per fiscal year must be expended for projects related to heated bridge technologies, and not less than $2,000,000 must be expended for projects related to all weather pavement markings.

A seismic research program must be carried out under this section in cooperation with a national earthquake engineering center to study the vulnerability of Federal-aid system highways, tunnels, and bridges to earthquakes and to develop and implement cost-effective mothods of retrofitting highway facilities. Program progress and research findings are to be reported to Congress two years after date of enactment. Up to $4,000,000 per fiscal year may be expended for carrying out seismic research under this section.

SECTION 606. UNIVERSITY TRANSPORTATION CENTERS

Section 11(b)(2) of the Urban Mass Transportation Act of 1964 is amended to include transportation safety as an areas of responsibility for University Transportation Centers. Section 11 is also amended to designate three new centers: a national center for transportation management, research, and development; a center for transportation and industrial productivity; and a national rural transportation study center. Provisions of the 1964 Act requiring a National Advisory Council are deleted and replaced by a requirement that the Centers' studies be coordinated and disseminated by the Secretary. Up to one percent of funds provided for the University Transportation Center program are made available to the Secretary for its administration.

SECTION 607. UNIVERSITY RESEARCH INSTITUTES

Section 11 of the Urban Mass Transportation Act of 1964 is amended by this section to require the Secretary to make grants to establish and operate an institute for national surface transportation policy studies at San Jose State University and an infrastructure technology institute at Northwestern University. Funding of $250,000 per fiscal year is authorized for the institute for national surface transportation policy studies and $3,000,000 per year fiscal year is authorized for the infrastructure technology institute.

SECTION 608. NATIONAL COUNCIL ON SURFACE TRANSPORTATION RESEARCH

This section establishes a National Council on Surface Transportation Research to investigate and study national and international surface transportation research and technology developments. The Council is directed to identify gaps and duplication in current re-

search efforts, determine where research might lead to increased efficiency, productivity, safety, and durability in surface transportation systems, and develop a national plan for surface transportation research and development. Specific matters to be addressed are outlined. Members of the Council are to be appointed by he President and Congress.

A Research Advisory Committee will be a permanent advisory body with the primary goal of looking at long-term research needs. The Committee will report annually to Congress.

SECTION 609. DOT DATA NEEDS

Through an agreement with the DOT, the National Academy of Sciences is directed under this section to conduct an 18-month study of the adequacy of DOT data collection procedures and capabilities, including an evaluation of data collection resources, needs, and requirements, systems, capabilities, and procedures. Study results and recommendations for improving DOT data collection and analysis must be reported to the Committee on Environment and Public Works of the Senate and the Committee on Public Works and Transportation of the House of Representatives.

SECTION 610. STATE LEVEL OF EFFORT

This section requires the Secretary to study the most appropriate and accurate methods of calculating state level of effort in funding surface transportation programs and a report to Congress on study results.

SECTION 611. EVALUATION OF STATE PROCUREMENT PRACTICES

DOT is required to conduct a study of state department and agency quality assurance practices in procurement. A report to Congress to study results and an assessment of the need for a national policy of transportation quality assurance is required.

SECTION 612. AUTOMATED INTRUSION ALARMS FOR HIGHWAY CONSTRUCTION WORK ZONES

This section requires that the Secretary conduct a study on occupational injury and fatality statistics for street and highway work zones. A report to Congress on study results and recommendations for revisions to the manual for uniform traffic control devices is required in two years.

SECTION 613. BUS TESTING

This section amends Section 12(h) of the Urban Mass Transportation Act of 1964 to clarify that new bus models required to be tested under that Act include buses using alternative fuels.

An amendment to 317(b)(1) of the Surface Transportation and Uniform Relocation Assistance Act of 1987 requires that braking performance and emissions tests be conducted on new bus models. Funding of $1.5 million is provided to the bus testing center to purchase and install new testing equipment in accordance with new testing requirements, and a revolving fund of $2.5 million is established to fund bus testing facility operations and maintenance.

Funds advanced under such circumstances are to be repaid to the loan fund.

SECTION 614. NATIONAL TRANSIT INSTITUTE

Under this section the Secretary is directed to make grants for the establishment of a national transit institute to develop and administer training programs on a broad range of transit matters, techniques and procedures for Federal, state, and local transportation employees engaged or to be engaged in Federal-aid transit work. Training in subject areas which are a Federal responsibility must be provided at no cost to state and local transportation employees.

The Secretary is to make available $3,000,000 per fiscal year from funds provided under Section 21(h) for carrying out national transit institute activities.

States and public transit agencies may use up to one half percent of section 3 and 9 funds for up to 80 percent of tuition and direct education and training expenses for state and local transportation department employees.

SECTION 615. NATIONAL TRANSIT INSTITUTE

Section 615 amends Section 301(5) of title 49, United States Code, by inserting "and including basic highway vehicle science."

SECTION 616. RESEARCH AND DEVELOPMENT AUTHORITY OF SECRETARY OF TRANSPORTATION

Section 616 amends section 101(b)(4) of title 49, United States Code, by inserting "through research and development or otherwise."

SECTION 617. PURPOSES OF DEPARTMENT OF TRANSPORTATION

Section 617 establishes a Conference on Advanced Automotive Technologies of motor vehicle manufacturers, ports suppliers, Federal laboratories, and motor vehicles to explore ways of improving the competitiveness of the U.S. motor vehicle industry. This section also establishes a National Award for the Advancement of Motor Vehicle Research, to be presented periodically to one or more individuals or organizations who have made substantial advances in the field. No federal money is authorized for the prize.

SECTION 618. NONAPPLICABILITY TO RAIL

This section provides that the provisions of Title VI and amendments made thereby do not apply to rail transportation.

Part B: Intelligent Vehicle-Highway System Act

SECTION 651. SHORT TITLE

This Part is entitled the "Intelligent Vehicle-Highway Systems Act of 1991".

SECTION 652. THE ESTABLISHMENT AND SCOPE OF THE PROGRAM

This section is to "promote and facilitate the implementation of intelligent vehicle-highway systems" (IVHS). The Secretary is assigned responsibility to conduct such a program and a series of six goals are specified.

SECTION 653. GENERAL AUTHORITIES AND REQUIREMENTS

This section provides that the Secretary shall consult with the Secretary of Commerce, the Administrator of the Environmental Protection Agency, the Director of the National Science Foundation, and the heads of other interested Federal departments and agencies in carrying out the program. The Secretary shall develop and implement standards and protocols to promote wide-spread use and evaluation of IVHS technology. To the extent possible, standards and protocols shall promote compatibility among IVHS systems. The Secretary shall also develop guidelines for the evaluation of operational tests and establish an information clearinghouse for technical and safety data. The Secretary can delegate the operation of the clearinghouse to an organization not within the Department of Transportation, which would be eligible for assistance under this part. The Secretary is authorized to use one or more advisory committees (under the Federal Advisory Committee Act) in carrying out responsibilities under the Act.

SECTION 654. STRATEGIC PLAN, IMPLEMENTATION, AND REPORT TO CONGRESS

This section requires that the Secretary prepare three types of IVHS-related documents. The strategic plan is to be completed within one year after enactment of the Act. It is to cover goals, objectives, non-technical constraints, a course of action, the development of standards and protocols, and acceleration of use of advanced technology. The Secretary is directed to develop a completely automated highway and vehicle system as a prototype for future systems. A report on the implementation of the strategic plan is due to Congress within two years, and annually thereafter. Also due within two years is a report on the non-technical constraints and barriers to the IVHS program. This report is to be prepared in cooperation with the Attorney General and the Secretary of Commerce, and an update is due within five years.

SECTION 655. TECHNICAL, PLANNING, AND OPERATIONAL TESTING PROJECT ASSISTANCE

This section authorizes the Secretary to provide assistance and information to state and local governments and make grants for feasibility and planning studies. This section also declares that any interagency traffic and incident management entity contracted to a state department of transportation for the development and implementation of traffic management systems of designated corridors is eligible for receipt of IVHS funds through the state DOT.

The Secretary may make grants to state and local governments for operational tests using criteria which includes giving highest priority to projects which would contribute to the IVHS strategic

plan and minimizing the relative percentage of Federal contributions (not including Federal-aid funds) to total project cost. Operational test projects are to advance the state of knowledge, build on previous successes, and include written evaluations.

SECTION 656. APPLICATIONS OF TECHNOLOGY

This section establishes the IVHS Corridors Program, through which the Secretary is to designate transportation corridors which will benefit from IVHS technology. Financial and technical assistance is to be applied to assist in the implementation of such systems.

Not less than 50 percent of the funds authorized for this section is to be provided to 3–10 corridors. These corridors must:

Have a traffic density at least 1.5 times the national average;

Be in a severe or extreme ozone nonattainment area (as designated by the EPA under the Clean Air Act);

Include a variety of types of transportation facilities such as highway, bridges, tunnels, toll and non-toll;

Have an inability to significantly expand existing surface transportation facilities;

Include a mix of passenger, transit, and commercial motor vehicle traffic;

Have complex traffic patterns, and

Potentially contribute to the IVHS strategic plan developed under section 654.

The balance of funding (beyond the selected 3 to 10 corridors above) is to be used in corridors and areas where the application of IVHS and associated technologies will demonstrate benefits related to any of the following: improved operating efficiency, reduced regulatory burden, improved commercial productivity, improved safety, and enhanced motorist and traveler performance. The designated corridors may be in urban and rural areas, but urban corridors shall have a significant number of the characteristics set forth above.

SECTION 657. COMMERCIAL MOTOR VEHICLE SAFETY TECHNOLOGY

This section provides that the technology shall be studied and evaluated by the Secretary to test warning devices which alert vehicle operators if a turn, lane or other intended movement will place the vehicle in the path of an adjacent object or vehicle. The Secretary shall submit a report not later than two years after this Act to the applicable public works committees of the Senate and House on the study conducted on this technology.

SECTION 658. FUNDING

Funding is $150 million annually for fiscal years 1992 to 1996 for conduct of the IVHS Corridors Program, to be provided as part of the funds deducted under 23 USC 104(a). If the Secretary does not allocate a portion of the funds to carry out the IVHS Corridors Program (sec. 656) for fiscal years 1992 and 1993, he may use the portion to carry out other activities authorized under this part. Funds shall remain available until expended.

For carrying out IVHS activities other than the IVHS Corridors Program (sec. 656), the Secretary shall designate not less than $50 million for each of the fiscal years 1992 to 1996. Funds are available until expended, and Federal share is limited to 80%.

Of the funds made available under the IVHS Corridors Program, at least 5% of these funds are to be used for innovative, high-risk operational or analytical tests which may contribute significantly to the strategic plan, but do not attract non-Federal funding. The Secretary may waive the funding match requirement for these activities.

SECTION 659. DEFINITIONS

Definitions include those for "Intelligent Vehicle-Highway Systems", "corridor", and "state".

COMMITTEE ACTION AND VOTE

With respect to clause 2(l)(2) (a) and (b) of the Rules of the House of Representatives, the Committee favorably reported H.R. 2950 by a vote of 49 to 7 on July 25, 1991.

OVERSIGHT FINDINGS AND RECOMMENDATIONS

With respect to clause 2(l)(3)(A) of rule XI of the Rules of the House of Representatives, the Committee reports that no separate hearings were held on the subject matter of the legislation by the Subcommittee on Investigations and Oversight.

With respect to clause 2(l)(3)(D) of rule XI of the Rules of the House of Representatives, the Committee has not received a report from the Committee on Government Operations pertaining to the subject matter.

CONGRESSIONAL BUDGET ACT REQUIREMENTS

With respect to clause 2(l)(3) (B) and (C) of rule XI of the Rules of the House of Representatives, and in compliance with section 308(a) and section 403 of the Congressional Budget Act of 1974, the Committee has not received a report as of the filing of this report.

INFLATIONARY IMPACT ANALYSIS

With respect to clause 2(l)(4) of rule XI of the Rules of the House of Representatives, the Committee reports that there should be no inflationary impact on prices and costs in the operation of the national economy by enactment of H.R. 2950.

COST ESTIMATE OF LEGISLATION

With respect to clause 7(A)(1) of rule XIII of the Rules of the House of Representatives, the Committee reports that H.R. 2950 may result in some additional cost to the Federal government.

With respect to clause 7(A)(2) of rule XIII of the Rules of the House of Representatives, the Committee reports that no cost estimate of H.R. 2950 was submitted to the Committee by the government agency.

CHANGES IN EXISTING LAW MADE BY THE BILL, AS REPORTED

In compliance with clause 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italic, existing law in which no change is proposed is shown in roman):

TITLE 23, UNITED STATES CODE

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CHAPTER 1.—FEDERAL-AID HIGHWAYS

Sec.
101. Definitions and declaration of policy.
102. Authorizations.

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[130. Railway-highway crossing.]
130. Combined highway safety improvement program.
131. Control of outdoor advertising.
132. Payments on Federal-aid projects undertaken by a Federal agency.
133. State flexible program.
[134. Transportation planning in certain urban areas.
[135. Traffic operations improvement programs.]
134. Metropolitan planning.
135. Statewide planning.

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[152. Hazard elimination program.]

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§ 101. Definitions and declaration of policy

(a) As used in this title, unless the context requires otherwise—

The term "apportionment" in accordance with section 104 of this title includes unexpended apportionments made under prior acts.

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The term "highway safety improvement project" means a project which corrects or improves high hazard locations, eliminates roadside obstacles, improves highway signing and pavement marking, *installs priority control systems for emergency vehicles at signalized intersections,* installs or replaces emergency motorist aid call boxes, or installs traffic control or warning devices at high accident potential locations.

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[The term "urbanized area" means an area so designated by the Bureau of the Census, within boundaries to be fixed by responsible State and local officials in cooperation with each other, subject to approval by the Secretary. Such boundaries shall, as a minimum, encompass the entire urbanized area within a State as designated by the Bureau of the Census.]

The term "urbanized area" means an area with a population of 50,000 or more designated by the Bureau of the Census, within boundaries to be fixed by responsible State and local officials in cooperation with each other, subject to approval by the Secretary.

(c) USE OF FEDERAL LANDS HIGHWAY FUNDS.—Funds authorized for forest highways, forest development roads and trails, public lands development roads and trails, park roads, parkways, Indian reservation roads, and public lands highways shall be available, at the discretion of the department charged with the administration of such funds, for the construction of pedestrian walkways and bicycle transportation facilities in conjunction with such trails, roads, highways, and parkways.

(d) STATE BICYCLE AND PEDESTRIAN COORDINATORS.—Each State receiving an apportionment under sections 104(b)(2), 104(b)(3), and 104(b)(6) of this title shall use such amount of the apportionment as may be necessary to fund in the State department of transportation a position of bicycle and pedestrian coordinator for promoting and facilitating the increased use of nonmotorized modes of transportation, including developing facilities for the use of pedestrians and bicyclists and public education, promotional, and safety programs for using such facilities.

(e) BRIDGES.—In any case where a highway bridge deck being replaced or rehabilitated with Federal financial participation is located on a highway, other than a highway access to which is fully controlled, on which bicycles are permitted to operate at each end of such bridge, and the Secretary determines that the safe accommodation of bicycles can be provided at reasonable cost as part of such replacement or rehabilitation, then such bridge shall be so replaced or rehabilitated as to provide such safe accommodations.

(f) FEDERAL SHARE.—For all purposes of this title, construction of a pedestrian walkway and a bicycle transportation facility shall be deemed to be a highway project and the Federal share payable on account of such construction shall be 80 percent.

(g) PLANNING.—Pedestrian walkways and bicycle transportation facilities to be constructed under this section shall be located and designed pursuant to an overall plan which will provide due consideration for safety and contiguous routes.

(h) USE OF MOTORIZED VEHICLES.—No motorized vehicles shall be permitted on pedestrian walkways and trails under this section, except for—

(1) maintenance purposes;

(2) when snow conditions and State or local regulations permit, snowmobiles; and

(3) when State and local regulations permit, motorized wheelchairs.

(i) TRANSPORTATION PURPOSE.—No bicycle project may be carried out under this section unless the Secretary has determined that such bicycle project will be principally for transportation, rather than recreation, purposes.

(j) BICYCLE TRANSPORTATION FACILITY DEFINED.—For purposes of this section, a "bicycle transportation facility" means new or improved lanes, paths, or shoulders for use by bicyclists, traffic control devices, shelters, and parking facilities for bicycles.

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CHAPTER 3.—GENERAL PROVISIONS

Sec.
301. Freedom from tolls.
302. State highway department.
303. Management systems.

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313. Highway safety promotion program.

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325. Education and training program.
326. International transportation outreach program.

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SEC. 303. MANAGEMENT SYSTEMS.

(a) REGULATIONS.—Not later than 1 year after the date of the enactment of this section, the Secretary shall issue regulations for State development, establishment, and implementation of a system for managing each of the following:

(1) Highway pavement of the Federal-aid system.
(2) Bridges on and off the Federal-aid system.
(3) Highway and transportation safety.
(4) Traffic congestion.
(5) Public transportation facilities and equipment.
(6) Intermodal transportation facilities and systems.

Such regulations may include a compliance schedule for development, establishment, and implementation of each such system and minimum standards for each such system.

(b) TRAFFIC MONITORING.—Not later than 1 year after the date of the enactment of this section, the Secretary shall issue guidelines and requirements for the State development, establishment, and implementation of a traffic monitoring system for highways and public transportation facilities and equipment.

(c) STATE REQUIREMENTS.—The Secretary may withhold 10 percent of the funds apportioned under this title and under the Urban Mass Transportation Act of 1964 for any fiscal year beginning after September 30, 1995, to any State and any recipient of assistance under such Act in the State, and may not approve a grant to a recipient in the State under such Act in such fiscal year, unless, in the preceding fiscal year, the State was implementing each of the management systems described in subsection (a) and, before January 1 of the preceding fiscal year, the State certified, in writing, to the Secretary, that the State was implementing each of such management systems in the preceding fiscal year.

(d) PROCEDURAL REQUIREMENTS.—In developing and implementing a management system under this section, each State shall cooperate with metropolitan planning organizations for urbanized areas of the State and affected agencies receiving assistance under the Urban Mass Transportation Act of 1964 and shall consider the results of the management systems in making project selection decisions under this title and under such Act.

(e) INTERMODAL REQUIREMENTS.—The management system required under this section for intermodal transportation facilities and systems shall provide for improvement and integration of all of a State's transportation systems and shall include methods of achieving the optimum yield from such systems, methods for increasing productivity in the State, methods for increasing use of ad-

vanced technologies, and methods to encourage the use of innovative marketing techniques, such as just-in-time deliveries.

(f) ANNUAL REPORT.—Not later than January 1 of each calendar year beginning after December 31, 1992, the Secretary shall transmit to Congress a report on the progress being made by the Secretary and the States in carrying out this section.

(g) FUNDING.—Subject to approval by the Secretary in accordance with the program of projects approval process of section 105, a State may obligate funds apportioned after September 30, 1991, under subsections (b)(1), (b)(2), (b)(3), and (b)(6) of section 104 of this title for developing and establishing management systems required by this section and funds apportioned under section 144 of this title for developing and establishing the bridge management system required by this section.

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§ 307. Research and planning

[(a) The Secretary is authorized in his discretion to engage in research on all phases of highway construction, modernization, development, design, maintenance, safety, financing, and traffic conditions, including the effect thereon of State laws and is authorized to test, develop, or assist in the testing and developing of any material, invention, patented article, or process. The Secretary may publish the results of such research. The Secretary may carry out the authority granted hereby, either independently, or in cooperation with any other branch of the Government, State agency, authority, association, institution, corporation (profit or nonprofit), or any other organization, or person. The Secretary is also authorized, acting independently or in cooperation with other Federal departments, agencies, or instrumentalities, to make grants for research fellowships for any purpose for which research is otherwise authorized by this section. The funds required to carry out the provisions of this subsection shall be taken out of the administrative and research funds authorized by section 104 of this title, funds authorized to carry out section 403 of this title, and such funds as may be deposited in a special account with the Secretary of the Treasury for such purposes by any cooperating organization or person. The provisions of section 3709 of the Revised Statues, as amended (41 U.S.C. 5), shall not be applicable to contracts or agreements made under the authority of this subsection.]

(a) RESEARCH AND TECHNOLOGY PROGRAM.—

(1) AUTHORITY OF THE SECRETARY.—The Secretary may engage in research, development, and technology transfer activities on motor carrier transportation and all phases of highway planning and development including construction, operation, modernization, development, design, maintenance, safety, financing, and traffic conditions, including the effect of State laws and is authorized to test, develop, or assist in the testing and developing of any material, invention, patented article, or process. The Secretary may carry out the authority granted by this section, either independently, or in cooperation with any other branch of the Government or by making grants to, and entering into contracts and cooperative agreements with the National Acade-

my of Sciences, the American Association of State Highway and Transportation Officials, or any State agency, authority, association, institution, corporation (profit or nonprofit), organization or person. The Secretary is also authorized, acting independently or in cooperation with other Federal departments, agencies, or instrumentalities, to make grants for research fellowships for any purpose for which research is authorized by this section.

(2) COLLABORATIVE RESEARCH AND DEVELOPMENT.—For purposes of encouraging innovative solutions to highway problems and stimulating the marketing of new technology by private industry, the Secretary is authorized to undertake on a cost-shared basis, collaborative research and development with non-Federal entities, including State and local governments, foreign governments, colleges and universities, corporations, institutions, partnerships, sole proprietorships, and trade associations which are incorporated or established under the laws of any of State. In carrying out this section, the Secretary may enter into a cooperative research and development agreement, as defined in section 12 of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3710a). The average Federal share in these agreements shall not exceed 50 percent; except that, if there is substantial public interest or benefit, the Secretary may approve a higher Federal level of participation. Cooperative research and development agreements shall recognize all directly related costs to the non-Federal partners, including personnel, travel, and hardware development. The research, development, or utilization of any technology pursuant to an agreement under this paragraph, including the terms under which technology may be licensed and the resulting royalties may be distributed, shall be subject to provisions of such Act.

(3) FUNDS.—The funds required to carry out the provisions of this subsection and subsections (b), (d), and (e) shall be taken out of the administrative funds authorized by section 104(a) and funds as may be deposited in a special account with the Secretary of the Treasury for those purposes by any cooperating organization or person. Not less than 15 percent of these funds shall be used for long-term research projects. The term "long-term research project", as used in this paragraph, means a research project which is unlikely to be completed within 10 years. The provisions of section 3709 of the Revised Statutes (41 U.S.C. 5) shall not be applicable to contracts or agreements made under the authority of this section.

(b) *MANDATORY CONTENTS OF RESEARCH PROGRAM.—*

(1) INCLUSION OF CERTAIN STUDIES.—The Secretary shall include in the highway research progam herein authorized studies of economic highway geometrics, structures, and desirable weight and size standards for vehicles using the public highways and of the feasibility of uniformity in State regulations with respect to such standards. The highway research program herein authorized shall also include studies to identify and measure, quanti ively and qualitatively, those factors which relate to economic, social, environmental, and other impacts of highway projects.

(2) IMPLEMENTATION OF SHARP RESULTS.—The highway research program under subsection (a) shall include a program to implement results of the strategic highway research program carried out under subsection (d) (including results relating to automatic instrusion alarms for street and highway construction work zones) and to continue the long-term pavement performance tests being carried out under such program. Of amounts deducted under section 104(a) for each fiscal years 1992, 1993, 1994, 1995, and 1996, the Secretary shall expend not less than $12,000,000 in fiscal year 1992, $16,000,000 in fiscal year 1993, and $20,000,000 per fiscal year for fiscal years 1994, 1995, and 1996 to carry out this paragraph.

[(c)(1) Not to exceed 1½ per centum of the sums apportioned for each fiscal year beginning with fiscal year 1974 to any State under section 104 of this title and for highway projects under section 103(e)(4) shall be available for expenditure upon request of the State highway department, with the approval of the Secretary, with or without State funds, for engineering and economic surveys and investigations; for the planning of future highway programs and local public transportation systems and for planning for the financing thereof; for studies of the economy, safety, and convenience of highway usage and the desirable regulation and equitable taxation thereof; and for research and development, necessary in connection with the planning, design, construction, and maintenance of highways and highway systems and for study, research and training on engineering standards and construction materials, including evaluation and accreditation of inspection and testing, and the regulation and taxation of their use.

[(2) One and one-half per centum of the sums apportioned for each fiscal year beginning with the fiscal year 1983 to any State under sections 104 and 144 of this title shall be available for expenditure by the State highway department only for the purposes enumerated in paragraph (1) of this subsection.

[(3) In addition to the percentage provided in paragraph (2) of this subsection, not to exceed one-half of one per centum of sums apportioned for each fiscal year beginning with the fiscal year 1964 under paragraphs (1), (2), and (3) of section 104(b) of this title shall be available for expenditure upon request of the State highway department for the purposes enumerated in paragraph (1) of this subsection, including demonstration projects in connection with such purposes.

[(4) Sums made available under paragraphs (2) and (3) of this subsection shall be matched by the State in accordance with section 120 of this title unless the Secretary determines that the interests of the Federal-aid highway program would be best served without such matching.

[(5) The sums provided pursuant to paragraph (2) of this subsection shall be combined and administered by the Secretary as a single fund which shall be available for obligation for the same period as funds apportioned under section 104(b)(1) of this title.]

(c) STATE PLANNING AND RESEARCH.—

(1) GENERAL RULE.—One and ½ percent of the sums apportioned for each fiscal year beginning with fiscal year 1992 to any State under sections 104 and 144 of this title and for high-

way projects under section 103(e)(4) shall be available for expenditure by the State highway department in consultation with the Secretary only for engineering and economic surveys and investigations; for the planning of future highway programs and local public transportation systems and for planning for the financing thereof, including statewide planning under section 135 of this title; for development and implementation of management systems under section 303 of this title; for studies of the economy, safety, and convenience of highway usage and the desirable regulation and equitable taxation thereof; and for research, development, and technology transfer activities necessary in connection with the planning, design, construction, and maintenance of highway, public transportation, and intermodal systems and for study, research, and training on engineering standards and construction materials, including evaluation and accreditation of inspection and testing, and the regulation and taxation of their use. Not less than 25 percent of the sums made available to a State in a fiscal year under this paragraph shall be expended by the State for research, development, and technology transfer activities described in this paragraph relating to highway, public transportation, and intermodal systems.

(2) STATE MATCH.—Sums made available under paragraph (1) shall be matched by the State in accordance with section 120 of this title unless the Secretary determines that the interests of the Federal-aid highway program would be best served without such matching.

(3) ADMINISTRATION OF SUMS.—Sums made available under paragraph (1) shall by combined and administered by the Secretary as a single fund which shall be available for obligation for the same period as funds apportioned under section 104(b)(1) of this title.

* * * * * * *

(e) APPLIED RESEARCH AND TECHNOLOGY PROGRAM.—

(1) ESTABLISHMENT.—The Secretary shall establish and implement in accordance with this subsection an applied research and technology program for the purpose of accelerating testing, evaluation, and implementation of technologies which are designed to improve the durability, efficiency, environmental impact, productivity, and safety of highway, transit, and intermodal transportation systems.

(2) GUIDELINES.—Not later than 18 months after the date of the enactment of this subsection, the Secretary shall issue guidelines to carry out this subsection. Such guidelines shall include:

(A) TECHNOLOGIES.—Guidelines on the selection of both foreign and domestic technologies to be tested.

(B) TEST LOCATIONS.—Guidelines on the selection of locations at which tests will be conducted. Such guidelines shall ensure that testing is conducted in a range of climatic, traffic, geographic, and environmental conditions, as appropriate for the technology being tested.

(C) DATA.—Guidelines for the scientific collection and evaluation of appropriate test data.

(3) TECHNOLOGIES.—Technologies which may be tested under this subsection include, but are not limited to—

(A) accelerated construction materials and procedures;

(B) environmentally beneficial materials and procedures;

(C) materials and techniques which provide enhanced serviceability and longevity under adverse climatic, environmental, and load effects;

(D) technologies which increase the efficiency and productivity of vehicular travel; and

(E) technologies and techniques which enhance the safety and accessibility of vehicular transportation systems.

(4) HEATED BRIDGE TECHNOLOGIES.—

(A) PROJECTS.—As part of the program under this subsection, the Secretary shall carry out projects to assess the state of technology with respect to heating the decks of bridges and the feasibility of, and costs and benefits associated with, heating the decks of bridges. Such projects shall be carried out by installing heating equipment on the decks of bridges which are being replaced or rehabilitated under section 144 of this title.

(B) MINIMUM NUMBER OF BRIDGES.—The number of bridges for which hearing equipment is installed under this subsection in fiscal year shall not be less than 10 bridges.

(5) ELASTOMER MODIFIED ASPHALT.—As part of the program under this subsection, the Secretary shall carry out a project in the State of New Jersey to demonstrate the environmental and safety benefits of elastomer modified asphalt.

(6) ALL WEATHER PAVEMENT MARKINGS.—A part of the program under this subsection, the Secretary shall carry out a program to demonstrate the safety and durability of all weather pavement markings.

(7) TESTING OF HIGHWAY TECHNOLOGIES.—Projects carried out under this subsection to test technologies related to highways shall be carried out on highways on the Federal-aid system.

(8) TECHNICAL ASSISTANCE.—The Secretary shall provide technical assistance to State and localities in carrying out projects under this subsection.

(9) ANNUAL REPORT.—Not later than 1 year after the date of the enactment of this subsection, and annually thereafter, the Secretary shall transmit to the Committee on Public Works and Transportiaton of the House of Representatives and the Committee on Environment and Public Works of the Senate a report on the progress and research findings of the program carried out under this subsection.

(10) FEDERAL SHARE.—The Federal share of the cost of a project carried out under this subsection shall not exceed 80 percent.

(11) FUNDING.—The Secretary shall expend from administrative and research funds deducted under section 104(a) of this title and funds made available under section 21(h) of the Urban Mass Transportation Act of 1964 $50,000,000 per fiscal year for each of fiscal years 1992, 1993, 1994, 1995, and 1996 to carry out this subsection. Of such amount, in each of such fiscal years, the Secretary shall expend not less than $5,000,000 per fiscal

year to carry out projects related to heated bridge technologies under paragraph (4) and not less than $2,000,000 per fiscal year to carry out projects related to all weather pavement markings. Amounts made available under this subsection shall remain available until expended and shall not be subject to any obligation limitation.

(f) SEISMIC RESEARCH PROGRAM.—

(1) ESTABLISHMENT.—The Secretary shall establish a program to study the vulnerability of highways, tunnels, and bridges on the Federal-aid system to earthquakes and develop and implement cost-effective methods of retorfitting such highways, tunnels, and bridges to reduce such vulnerability.

(2) COOPERATION.—The Secretary shall conduct the program under this section in cooperation with the National Center for Earthquake Research at the University of Buffalo.

(3) FUNDING.—Of amounts deducted under section 104(a) for each of fiscal years 1992, 1993, 1994, 1995, and 1996, the Secretary shall expend not more than $4,000,000 in each of such fiscal years to carry out this subsection.

(4) REPORT.—Not later than 2 years after the date of the enactment of this section, the Secretary shall transit to the Committee on Public Works and Transportation of the House of Representatives and the Committee on Environment and Public Works of the Senate a report on the progress and research findings of the program carried out under this section.

[e] *(g)* As used in this section the term "safety" includes, but is not limited to, highway safety systems, research, and development relating to vehicle, highway, and driver characteristics, accident investigations, communications, emergency medical care, and transportation of the injured.

[f] *(h)* The Secretary shall report to the Committee on Environment and Public Works of the Senate and the Committee on Public Works and Transportation of the House of Representatives in January 1983, and in January of every second year thereafter, estimates of the future highway needs of the Nation.

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§ 313. Highway Safety Promotion Program.

(a) ESTABLISHMENT.—The Secretary shall carry out research, development, and technology transfer activities to promote the safe operation and maintenance of commercial motor vehicles in interstate commerce.

(b) GRANTS.—To carry out the purposes of this section, the Secretary shall make grants to, and enter into cooperative agreements with, a not-for-profit membership organization that has been engaged exclusively in truck-related research and education since 1985.

(c) FEDERAL SHARE.—The Federal share of the costs of activities carried out under this section shall be 100 percent.

(d) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated, out of the Highway Trust Fund (other than the Mass Transit Account), $1,000,000 for fiscal year 1992; $1,150,000 for fiscal year 1993; $1,300,000 for fiscal year 1994; $1,450,000 for

safety program or determines that the State has begun implementing an approved program, as appropriate, prior to the end of the fiscal year for which the funds were withheld. If the Secretary determines that the State did not correct its failure within such period, the Secretary shall reapportion the withheld funds to the other States in accordance with the formula specified in this subsection not later than 30 days after such determination.

(d) APPLICABILITY OF CHAPTER 1.—

(1) IN GENERAL.—Except as otherwise provided in this subsection, all provisions of chapter 1 of this title that are applicable to National Highway System funds, other than provisions relating to the apportionment formula and provisions limiting the expenditure of such funds to the Federal-aid systems, shall apply to the highway safety funds authorized to be appropriated to carry out this section.

(2) INCONSISTENT PROVISIONS.—If the Secretary determines that a provision of chapter 1 of this title is inconsistent with this section, such provision shall not apply to funds authorized to be appropriated to carry out this section.

(3) CREDIT FOR STATE AND LOCAL EXPENDITURES.—The aggregate of all expenditures made during any fiscal year by a State and its political subdivisions (exclusive of Federal funds) for carrying out the State highway safety program (other than planning and administration) shall be available for the purpose of crediting such State during such fiscal year for the non-Federal share of the cost of any project under this section (other than one for planning or administration) without regard to whether such expenditures were actually made in connection with such project.

(4) INCREASED FEDERAL SHARE FOR CERTAIN INDIAN TRIBE PROGRAMS.—In the case of a local highway safety program carried out by an Indian tribe, if the Secretary is satisfied that an Indian tribe does not have sufficient funds available to meet the non-Federal share of the cost of such program, the Secretary may increase the Federal share of the cost thereof payable under this title to the extent necessary.

(5) TREATMENT OF TERM 'STATE HIGHWAY DEPARTMENT'.—In applying provisions of chapter 1 in carrying out this section, the term 'State highway department' as used in such provisions shall mean the Governor of a State.

(e) APPLICATION TO INDIAN RESERVATIONS.—For the purpose of the application of this section on Indian reservations, "State" and "Governor of a State" includes the Secretary of the Interior and "political subdivision of a State" includes an Indian tribe. Notwithstanding the provisions of subsection (a)(4)(C), 95 percent of the funds apportioned to the Secretary of the Interior under this section shall be expended by Indian tribes to carry out highway safety programs within their jurisdictions.

(f) PROTECTION OF TRAFFIC RECORD SYSTEM DATA.—Notwithstanding any other provision of law, if a report, list, schedule, or survey is prepared by or for a State or political subdivision thereof under subsection (a)(3)(D) and subsection (a)(2)(E), such report, list, schedule, or survey shall not be admitted as evidence or used in any

suit or action for damages arising out of any matter mentioned in such report, list, schedule, or survey.

(g) ANNUAL REPORT.—Not later than April 1 of each calendar year beginning after December 31, 1993, the Secretary shall transmit to Congress a report on the implementation of this section in the fiscal year preceding the date of such report. Such report shall include the recommendations of the Secretary under the uniform data collection and reporting program described in subsection (a)(2)(E) of this section for legislation necessary to implement programs developed by the Secretary to reduce traffic-related deaths and injuries.

§ 403. Highway safety research and development

[(a) The Secretary is authorized to use funds appropriated to carry out this subsection to carry out safety research which he is authorized to conduct by subsection (a) of section 307 of this title. In addition, the Secretary may use the funds appropriated to carry out this section, either independently or in cooperation with other Federal departments or agencies, for making grants to or contracting with State or local agencies, institutions, and individuals for (1) training or education of highway safety personnel, (2) research fellowships in highway safety, (3) development of improved accident investigation procedures, (4) emergency service plans, (5) demonstration projects, and (6) related activities which the Secretary deems will promote the purposes of this section. The Secretary shall assure that no fees are charged for any meetings or services attendant thereto or other activities relating to training and education of highway safety personnel.

[(b) In addition to the research authorized by subsection (a) of this section, the Secretary, in consultation with such other Government and private agencies as may be necessary, is authorized to carry out safety research on the following:

[(1) The relationship between the consumption and use of drugs and their effect upon highway safety and drivers of motor vehicles; and

[(2) Driver behavior research, including the characteristics of driver performance the relationships of mental and physical abilities or disabilities to the driving task, and the relationship of frequency of driver accident involvement to highway safety.]

(a) AUTHORITY OF THE SECRETARY.—

(1) IN GENERAL.—The Secretary is authorized to use funds appropriated to carry out this section to engage in research on all phases of highway safety and traffic conditions.

(2) ADDITIONAL AUTHORITY.—In addition, the Secretary may use the funds appropriated to carry out this section, either independently or in cooperation with other Federal departments or agencies, for—

(A) training or education of highway safety personnel,

(B) research fellowships in highway safety,

(C) development of improved accident investigation procedures,

(D) emergency service plans,

(E) demonstration projects, and

(F) related research and development activities which the Secretary deems will promote the purposes of this section.

(3) SAFETY DEFINED.—As used in this section, the term "safety" includes highway safety and highway safety-related research and development, including research and development relating to highway and driver characteristics, crash investigations, communications, emergency medical care, and transportation of the injured.

(b) DRUGS AND DRIVER BEHAVIOR.—In addition to the research authorized by subsection (a), the Secretary, in consultation with other Government and private agencies as may be necessary, is authorized to carry out safety research on the following:

(1) The relationship between the consumption and use of drugs and their effect upon highway safety and drivers of motor vehicles.

(2) Driver behavior research, including the characteristics of driver performance, the relationships of mental and physical abilities or disabilities to the driving task, and the relationship of frequency of driver crash involvement to highway safety.

* * * * * * *

[(f) In addition to the research authorized by subsection (a) of this section, the Secretary shall carry out research, development, and demonstration projects to improve and evaluate the effectiveness of various types of driver education programs in reducing traffic accidents and deaths, injuries, and property damage resulting therefrom. The research, development, and demonstration projects authorized by this subsection may be carried out by the Secretary through grants and contracts with public and private agencies, institutions, and individuals. The Secretary shall report to the Congress by July 1, 1975, and each year thereafter during the continuance of the program, on the research, development, and demonstration projects authorized by this subsection, and shall include in such report an evaluation of the effectiveness of driver education programs in reducing traffic accidents and deaths, injuries, and property damage resulting therefrom.]

(f) COLLABORATIVE RESEARCH AND DEVELOPMENT.—

(1) IN GENERAL.—For the purpose of encouraging innovative solutions to highway safety problems, stimulating voluntary improvements in highway safety, and stimulating the marketing of new highway safety-related technology by private industry, the Secretary is authorized to undertake, on a cost-shared basis, collaborative research and development with non-Federal entities, including State and local governments, colleges, and universities and corporations, partnerships, sole proprietorships, and trade associations that are incorporated or established under the laws of any State or the United States. This collaborative research may include crash data collection and analysis; driver and pedestrian behavior; and demonstrations of technology.

(2) COOPERATIVE AGREEMENTS.—In carrying out this subsection, the Secretary may enter into cooperative research and development agreements, as defined in section 12 of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3710a);

except that in entering into such agreements, the Secretary may agree to provide not more than 50 percent of the cost of any research or development project selected by the Secretary under this subsection.

(3) PROJECT SELECTION.—In selecting projects to be conducted under this subsection, the Secretary shall establish a procedure to consider the views of experts and the public concerning the project areas.

(4) APPLICABILITY OF STEVENSON-WYDLER TECHNOLOGY INNOVATION ACT.—The research, development, or utilization of any technology pursuant to an agreement under the provisions of this subsection, including the terms under which technology may be licensed and the resulting royalties may be distributed, shall be subject to the provisions of the Stevenson-Wydler Technology Innovation Act of 1980.

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[§ 409. Admission as evidence of certain reports and surveys]

§ 409. Discovery and admission as evidence of certain reports and surveys

Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to section 130, 144, and 152 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be **[**admitted into evidence in Federal or State court**]** *subject to discovery or admitted into evidence in a Federal or State court proceeding* or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

[§ 410. Drunk driving prevention programs

[(a) GENERAL AUTHORITY.—Subject to the provisions of this section and to the extent provided in advance in appropriation Acts, the Secretary shall make basic and supplemental grants to those States which adopt and implement drunk driving prevention programs which include measures described in this section to improve the effectiveness of the enforcement of laws the pupose of which are to discourage individuals from operating motor vehicles while under the influence of alcohol. Such grants may only be used by recipient States to implement and enforce such programs.

[(b) MAINTENANCE OF EFFORT.—No grant may be made to a State under this section in any fiscal year unless such State enters into such agreements with the Secretary as the Secretary may require to ensure that such State will maintain its aggregate expenditures from all other sources for drunk driving prevention programs at or above the average level of such expenditures in its 2 fiscal years preceding the date of enactment of this section.

(b) There are authorized to be appropriated to carry out the provisions of this title and the provisions of Public Law 86–660 (74 Stat. 526) not to exceed $1,000,000 for fiscal year 1983, not to exceed $1,300,000 for fiscal year 1984, not to exceed $1,600,000 for fiscal year 1985, not to exceed $1,600,000 for fiscal year 1986, [and] not to exceed $1,600,000 for fiscal year 1987, *not to exceed $6,131,000 for fiscal year 1992, not to exceed $6,363,978 for fiscal year 1993, and not to exceed $6,605,809 for fiscal year 1994.*

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TITLE 49, UNITED STATES CODE

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Subtitle I—Department of Transportation

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CHAPTER 1—ORGANIZATION

Sec.
101. Purpose.

* * * * * * *

[107. Urban Mass Transportation Administration.]
107. Federal Transit Administration.

* * * * * * *

§ 101. Purpose

(a) * * *

(b) A Department of Transportation is necessary in the public interest and to—

(1) * * *

* * * * * * *

(4) stimulate technological advances in transportation, *through research and development or otherwise*;

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[§ 107. Urban Mass Transportation Administration]

§ 107. Federal Transit Administration

(a) The [Urban Mass Transportation Administration] *Federal Transit Administration* is an administration in the Department of Transportation.

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CHAPTER 3—GENERAL DUTIES AND POWERS

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Subchapter I—Duties of the Secretary of Transportation

§ 301. Leadership, consultation, and cooperation

The Secretary of Transportation shall—

(1) * * *

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(3) coordinate Federal policy on intermodal transportation and initiate policies to promote efficient intermodal transportation in the United States;

[(3)] *(4)* promote and undertake the development, collection, and dissemination of technological, statistical, economic, and other information relevant to domestic and international transportation;

[(4)] *(5)* consult and cooperate with the Secretary of Labor in compiling information regarding the status of labor-management contracts and other labor-management problems and in promoting industrial harmony and stable employment conditions in all modes of transportation;

[(5)] *(6)* promote and undertake research and development related to transportation, including noise abatgement, with particular attention to aircraft noise, *and including basic highway vehicle science;*

[(6)] *(7)* consult with the heads of other departments, agencies, and instrumentalities of the United States Government on the transportation requirements of the Government, including encouraging them to establish and observe policies consistent with maintaining a coordinated transportation system in procuring transportation or in operating their own transport services; and

[(7)] *(8)* consult and cooperate with State and local governments, carriers, labor, and other interested persons, including, when appropriate, holding informal public hearings.

§ 302. Policy standards for transportation

(a) * * *

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(d) INTERMODAL TRANSPORTATION.—It is the policy of the United States Government to encourage and promote development of a national intermodal transportation system in the United States to move people and goods in an energy-efficient manner, provide the foundation for improved productivity growth, strengthen the Nation's ability to compete in the global economy, and obtain the optimum yield from the Nation's transportation resources.

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Subtitle IV—Interstate Commerce

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CHAPTER 107—RATES, TARIFFS, AND VALUATIONS

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shall be established by renovation of a facility constructed with Federal assistance for the purpose of training rail personnel.

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(5) FUNDING.—There shall be available to the Secretary out of the Mass Transit Account of the Highway Trust Fund for establishment of the facility under paragraph (1) $200,000 for fiscal year 1987 and $3,000,000 for fiscal year 1988, *for expansion of such facility $1,500,000 for fiscal year 1992, and for establishment of a revolving fund under paragraph (6) $2,500,000 for fiscal year 1992.* Funds made available by this paragraph shall remain available until expended and shall not be subject to any obligation limitation.

(6) REVOLVING LOAN FUND.—The Secretary shall establish a bus testing revolving loan fund with amounts authorized for such purpose under paragraph (5). The Secretary shall make available as repayable advances amounts from the fund to the person described in paragraph (3) for operating and maintaining the facility.

STEVENSON-WYDLER TECHNOLOGY INNOVATION ACT OF 1980

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SEC. 10. ADMINISTRATIVE ARRANGEMENTS.

(a) * * *

* * * * * * *

(d) COOPERATIVE EFFORTS.—The Secretary and the National Science Foundation shall, on a continuing basis, provide each other the opportunity to comment on any proposed program of activity under section 7, 9, 11, 15, 17, or [18] *20* of this Act before funds are committed to such program in order to mount complementary efforts and avoid duplication.

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SEC. 18. CONFERENCE ON ADVANCED AUTOMOTIVE TECHNOLOGIES.

Not later than 180 days after the date of the enactment of this section, the Secretary, through the Under Secretary of Commerce for Technology, in consultation with other appropriate officials, shall convene a conference of domestic motor vehicle manufacturers, parts suppliers, Federal laboratories, and motor vehicle users to explore ways in which cooperatively they can improve the competitiveness of the United States motor vehicle industry by developing new technologies which will enhance the safety and energy savings, and lessen the environmental impact, of domestic motor vehicles, and the results of such conference shall be published and then submitted to the President and to the Committees on Science, Space, and Technology and Public Works and Transportation of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate.

SEC. 19. ADVANCED MOTOR VEHICLE RESEARCH AWARD.

(a) ESTABLISHMENT.—There is established a National Award for the Advancement of Motor Vehicle Research. The award shall con-

sist of a medal, and a cash prize if funding is available for the prize under subsection (c). The medal shall be of such design and materials and bear inscriptions as is determined by the Secretary of Transportation.

(b) MAKING AND PRESENTING AWARD.—The Secretary of Transportation shall periodically make and present the award to domestic motor vehicle manufacturers, suppliers, or Federal laboratory personnel who, in the opinion of the Secretary of Transportation, have substantially improved the domestic motor vehicle in safety, energy savings, or environmental impact. No person may receive the award more than once every 5 years.

(c) FUNDING FOR AWARD.—The Secretary of Transportation may seek and accept gifts of money from private sources for the purpose of making cash prize awards under this section. Such money may be used only for that purpose, and only such money may be used for that purpose.

SEC. [18.] *20.* PERSONNEL EXCHANGES.

The Secretary and the National Science Foundation, jointly, shall establish a program to foster the exchange of scientific and technical personnel among academia, industry, and Federal laboratories. Such program shall include both (1) federally supported exchanges and (2) efforts to stimulate exchanges without Federal funding.

SEC. [19.] *21.* AUTHORIZATION APPROPRIATIONS.

(a)(1) There is authorized to be appropriated to the Secretary for the purposes of carrying out sections 5, 11(g), and 16 of this Act not to exceed $3,400,000 for the fiscal year ending September 30, 1988.

(2) Of the amount authorized under paragraph (1) of this subsection, $2,400,000 is authorized only for the Office of Productivity, Technology, and Innovation; $500,000 is authorized only for the purpose of carrying out the requirements of the Japanese technical literature program established under section 5(d) of this Act; and $500,000 is authorized only for the patent licensing activities of the National Technical Information Service.

(b) In addition to the authorization of appropriations provided under subsection (a) of this section, there is authorized to be appropriated to the Secretary for the purposes of carrying out section 6 of this Act not to exceed $500,000 for the fiscal year ending September 30, 1988, $1,000,000 for the fiscal year ending September 30, 1989, and $1,500,000 for the fiscal year ending September 30, 1990.

(c) Such sums as may be appropriated under subsections (a) and (b) shall remain available until expended.

(d) To enable the National Science Foundation to carry out its powers and duties under this Act only such sums may be appropriated as the Congress may authorize by law.

SEC. [20.] *22.* SPENDING AUTHORITY.

No payments shall be made or contracts shall be entered into pursuant to the provisions of this Act (other than sections 11, 12, and 13) except to such extend or in such amounts as are provided in advance in appropriations Acts.

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